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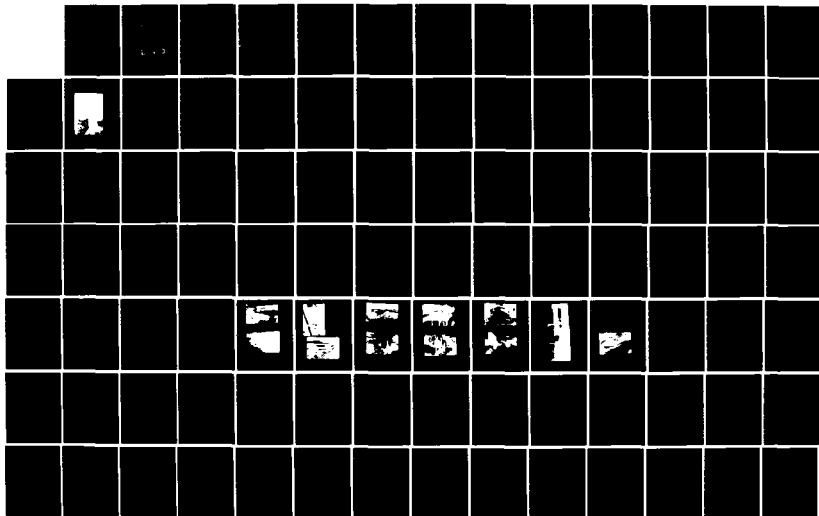
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS  
SEBEC DAM ME 00163 PE. (U) CORPS OF ENGINEERS WALTHAM  
MA NEW ENGLAND DIV JUN 81

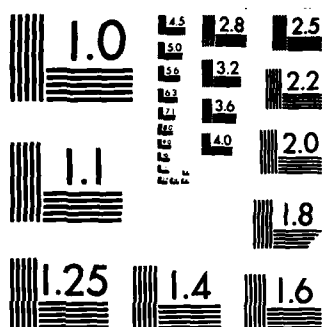
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A155 796

PENOBSCOT RIVER BASIN  
SEBEC, MAINE

SEBEC DAM  
ME 00163

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



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ELECTE  
JUN 28 1985  
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DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS. 02154

JUNE, 1981

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle)  Sebec Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Penobscot River Basin Sebec Maine Sebec River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  ✓ The dam is about 276 ft. long with a height of 16 ft. The dam is considered to be in fair condition. Continued spalling and erosion of the gate structure concrete could eventually compromise its structural stability. It is large in size with a hazard classification of significant. It is recommended that the owner engage a qualified engineer to further assess the spalled and eroded concrete of the old power station and fishway,		

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DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02254

REPLY TO  
ATTENTION OF  
NEDED

AUG 07 1981

Honorable Joseph E. Brennan  
Governor of the State of Maine  
State Capitol  
Augusta, Maine 04330

Dear Governor Brennan:

Inclosed is a copy of the Sebec Dam (ME-00163) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Agriculture and to the owner, Bangor Hydro-Electric Company, Bangor, Maine. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Agriculture for your cooperation in in this program.

Sincerely,

Incl  
As stated

C. E. EDGAR, III  
Colonel, Corps of Engineers  
Commander and Division Engineer



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PENOBSCOT RIVER BASIN

SEBEC DAM

ME 00163

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASSACHUSETTS 02154

FEBRUARY, 1981

LETTER OF TRANSMITTAL  
FROM THE CORPS OF ENGINEERS TO THE STATE  
TO BE SUPPLIED BY THE CORPS OF ENGINEERS



## BRIEF ASSESSMENT

### PHASE I INSPECTION REPORT

#### NATIONAL PROGRAM OF INSPECTION OF DAMS

Identification Number: ME00163  
Name of Dam: SEBEC DAM  
Town: SEBEC  
County and State: PISCATAQUIS COUNTY, MAINE  
Stream: SEBEC RIVER  
Date of Inspection: NOVEMBER, 1980


The dam, constructed prior to 1882, is a rock-filled timber crib structure, capped and liberally reinforced with concrete, approximately 276 feet long and 16 feet in height. The structure includes a 20-foot long abutment section on the left, a 178-foot spillway section, a 20-foot fish passage to the right of the spillway, and a 58-foot structure which forms the right abutment and contains two outlet sluice gates. The spillway is divided into two sections, 58 feet being 1 foot higher than the remaining 120 feet. Upstream and downstream faces of the dam are vertical. The two manually operated sluice gates are 11 feet wide by 10 feet high and are reported operable.

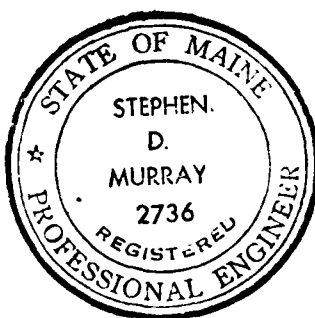
The dam impounds Sebec Lake and is on the Sebec River approximately 9.2 miles upstream of its confluence with the Piscataquis River. It is used for water storage and flow regulation for downriver hydro-electric facilities, and seasonally for maintenance of lake level. The lake is about 11.5 miles long with a surface area of approximately 6,800 acres. Storage capacity to the top of the dam is estimated at 150,000 acre-feet.

Based upon the visual inspection and the review of available data regarding this facility, the dam is considered to be in Fair condition. Continued spalling and erosion of the gate structure concrete could eventually compromise its structural stability.

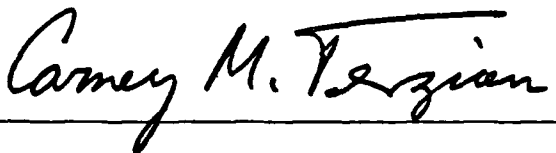
In accordance with the Corps of Engineers Guidelines and the size (LARGE) and hazard (SIGNIFICANT) classification of the dam, the Test Flood selected was equivalent to the Probable Maximum Flood (PMF). Peak inflow to the reservoir is 85,000 cfs; routed peak outflow from the dam is 43,000 cfs with the water elevation 26.5 feet above the dam crest. The spillway capacity is 9,400 cfs, (13,300 cfs w/o flashboards) which is equivalent to approximately 22% (31% w/o flashboards) of the routed Test Flood outflow from the dam. Hydraulic computations indicate that outflow in excess of approximately 15,000 cfs will be controlled by downstream channel characteristics rather than the dam, thus spillway capacity, with flashboards in place, is about 63% of the maximum outflow controlled by the dam. Without flashboards, the spillway capacity is 89% of the maximum outflow.

It is recommended that the owner engage a qualified, registered engineer to further assess the spalled and eroded concrete of the old power station and fishway (gate structure) and submit recommendations for repair and rehabilitation. This and the remedial measures which are discussed in Section 7 should be instituted within one year of the owner's receipt of this report.

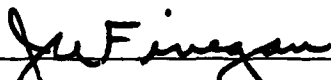
  
Stephen D. Murray, P.E.  
Project Manager  
James W. Sewall Company



This Phase I Inspection Report on Sebec Dam (ME-00163) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.



CARNEY M. TERZIAN, MEMBER  
Design Branch  
Engineering Division

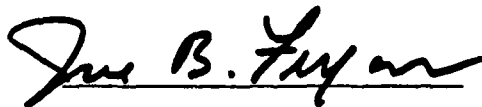


JOSEPH W. FINEGAN, JR., MEMBER  
Water Control Branch  
Engineering Division



ARAMAST MAHTESIAN, CHAIRMAN  
Geotechnical Engineering Branch  
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR  
Chief, Engineering Division

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

a. General - At the time of inspection on November 4, 1980, the water level in Sebec Lake, impounded by the dam, was 7 inches over the lower spillway section, with flashboards installed. The weather was cloudy and cool. The general condition of this dam is fair.

b. Dam - This is basically a timber crib, rock filled dam with concrete renovations and additions. The timbers have been capped with concrete to produce the spillway crest and apron as shown in Photos 1 and 2. As seen in Photo 2, there is a moderate amount of leakage from between some of the timbers of the crib. This was not considered indicative of any structural deficiency. Bedrock is exposed in the area of the right abutment as shown in Photo 3. The left abutment, shown in Photo 4, is concrete enclosed by steel sheet piling. Both the piling and the concrete abutment are in good condition. A stone riprapped slope goes from this abutment for some 30 yards upstream to the stub abutment of a highway bridge. This riprap is in good condition and extends up the slope to 3 feet above the water level on the day of inspection.

On the right side of the dam, as shown in Photo 5, is a concrete intake channel and forebay leading to the substructure of a former power station. The concrete walls of the forebay are in good condition. On the left side of the forebay adjacent to the old power station, as shown in Photo 6, a new fish passage was added in 1978. This has not been completed and there are no current plans to complete it. A concrete training wall leads upstream from the right side of the forebay to the other abutment of the highway bridge. This training wall is of recent construction and is in good condition.

#### c. Appurtenant Structures

Spillway - The concrete cap forming the spillway crest and apron is in good condition with only a few small cracks and minor erosion. The timbers underneath were inaccessible for inspection.

Outlet Structure - The outlet structure is of reinforced concrete and is the substructure of a power station which burned on August 19, 1940. Two sluice gates were installed in 1960 for the two 10'x11' openings at the downstream end of the forebay, as shown in Photo 7. These gates are lifted and controlled by a trolley type manual chain hoist hung from a steel frame above the gates. The hoist and gates are reported operable. It is reported that there are generally no problems with icing of the gates during the winter. Occasionally it has been necessary to steam the gates free. There are no remaining turbines or other equipment to impede the flow of water under the powerhouse floor. As shown in the left side of Photo 8, the water exits through two 10'x10' openings in the downstream foundation wall of the power station. The concrete of this structure is still essentially sound but many surfaces are badly spalled and eroded as seen in Photo 7 and 8. Where the surface has not yet spalled, there are numerous efflorescent stains as seen in Photo 6.

The detailed engineering data required to perform an in-depth stability analysis of the dam was not available. The final assessment of the dam, therefore, must be based primarily on visual inspection, performance history, and spillway capacity computations.

c. Validity - A comparison of records, data, and visual observations reveals no significant discrepancies, other than those noted above, between design and as-built dimensions.



## SECTION 2: ENGINEERING DATA

### 2.1 DESIGN

a. Available Data - Available data consists of the following plans by the Bangor Hydro-Electric Company, Bangor, Maine:

1. Sebec Dam, General Plan, January 23, 1961, Dwg. M-2061
2. Sebec Dam, General Plan, Nov. 19, 1975, Dwg. M-2061A
3. Sebec Lake Dam, Proposed Concrete Forebay, Aug. 29, 1977, Dwg. 3092
4. Sebec Lake Dam, Proposed Concrete Forebay, Changes to Accommodate Fishway, September 1, 1978, Dwg. 3092A

Also available was the General Plan and Elevation of Sebec Plant for Milo Light and Power Co., Sanders Engineering Co., Portland, Me., Dec. 13, 1920.

b. Design Features - The drawings, computations and inspection reports indicate the design features stated in Section 1.

c. Design Data - Design data consists of information on the drawings listed in "Available Data" and the information shown in Appendix B.

### 2.2 CONSTRUCTION

a. Available Data - Information as contained in any plans, drawings, or specifications previously listed in "Design Data" or Appendix B.

b. Construction Considerations - Since no original plans of the dam were available, there was no practical means to ascertain any construction changes. Post-construction changes are discussed in Section 6.3.

### 2.3 OPERATION

Pond level readings are taken irregularly, but as frequently as needed, to guide the operational procedures described in Section 4.1.

### 2.4 EVALUATION

a. Availability - Existing data was provided by the Bangor Hydro-Electric Co. and the Maine Office of Energy Resources.

b. Adequacy - Detailed hydrologic/hydraulic data were not available. Design data and field measurements were utilized in conjunction with New England Division - Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" to perform the computations of outflow capacity.

i. Spillway

- |                             |                |
|-----------------------------|----------------|
| 1. Type:                    | overflow       |
| 2. Length of weir:          | 178 ft         |
| 3. Crest el.                |                |
| with flashboards            | 323            |
| without flashboards 120 ft. | 321.2          |
| without flashboards 58 ft.  | 322.2          |
| 4. Gates:                   | N/A            |
| 5. Upstream channel:        | natural stream |
| 6. Downstream channel:      | natural stream |
| 7. General:                 | N/A            |

j. Regulating Outlets

- |                      |  |
|----------------------|--|
| 1. Invert:           | 309  |
| 2. Size:             | two 11 ft.-wide by<br>10-ft. high sluice<br>gates                        |
| 3. Description:      | steel wheeled gates<br>installed over old<br>powerhouse intakes          |
| 4. Control mechanism | gates are operated<br>by trolley-type<br>chain hoist                     |
| 5. Other:            | 4-ft. wide fish<br>passage at right<br>side of dam with<br>wood stoplogs |

e. Storage

- |                         |                 |
|-------------------------|-----------------|
| 1. Normal pool:         | 95,000 acre-ft  |
| 2. Flood control pool:  | N/A             |
| 3. Spillway crest pool: | 82,000 acre-ft  |
| 4. Top of dam:          | 150,000 acre-ft |
| 5. Test flood pool:     | 258,000 acre-ft |

f. Reservoir Surface

- |                        |                   |
|------------------------|-------------------|
| 1. Normal pool:        | 6,800 acres       |
| 2. Flood control pool: | N/A               |
| 3. Spillway crest:     | 6,800 acres $\pm$ |
| 4. Test flood pool:    | 7,400 acres $\pm$ |
| 5. Top of dam:         | 7,000 acres $\pm$ |

g. Dam

- |                     |                  |
|---------------------|------------------|
| 1. Type:            | rock-filled crib |
| 2. Length:          | 276 ft $\pm$     |
| 3. Height:          | 21 ft $\pm$      |
| 4. Top Width:       | 10 ft $\pm$      |
| 5. Side Slopes:     | vertical         |
| 6. Zoning:          | N/A              |
| 7. Impervious Core: | N/A              |
| 8. Cutoff:          | steel sheeting   |
| 9. Grout Curtain:   | N/A              |
| 10. Other:          | N/A              |

h. Diversion and Regulating Tunnel

N/A

6.	Gated spillway capacity at test flood el. 347.5	N/A
7.	Total spillway capacity at test flood el. 347.5	30,400 cfs w/flashboards 31,100 cfs w/o flashboards
8.	Total project discharge at top of dam el. 330.4 (controlled by tailwater)	15,000 cfs
9.	Total project discharge at test flood el. 347.5 (controlled by tailwater)	43,000 cfs
c.	<u>Elevation (Feet, NGVD)</u>	
1.	Streambed at toe of dam:	309 $\pm$
2.	Bottom of cutoff:	N/A
3.	Maximum tailwater:	unknown
4.	Recreation pool:	323
5.	Full flood control pool:	N/A
6.	Spillway crest (Ungated):	
	with flashboards	323
	without flashboards - 120 ft.	321.2
	without flashboards - 58 ft.	322.2
7.	Design surcharge (original design):	N/A
8.	Top of dam:	330.4
9.	Test flood surcharge:	347.5
d.	<u>Reservoir</u>	
1.	Length of normal pool:	11.5 mi
2.	Length of flood control pool:	N/A
3.	Length of spillway crest pool:	11.5 mi
4.	Length of pool at top of dam:	11.5 mi
5.	Length of test flood pool:	11.5 mi $\pm$

g. Purpose of Dam - Original purpose was water power, then hydro-electric generation. Currently used for water storage and flow regulation.

h. Design and Construction History - The timber crib rock-filled dam was built prior to 1882 to operate a saw mill. In about 1920, a stone masonry and concrete dam with power station was constructed by Boston Excelsior Company of Milo, Maine, about 100 feet downstream of the timber crib structure. The new dam reportedly failed as it was being filled, and the older timber crib structure was subsequently renovated and used, with the new powerhouse, for power generation. The power station was operated by Boston Excelsior and subsequent owners until it burned on August 19, 1940. The dam was later acquired by Bangor Hydro-Electric Company and has, over approximately the last 20 years, received considerable maintenance attention including concrete capping, steel sheeting and new sluice gates.

i. Normal Operational Procedures - Flow from the dam is controlled as necessary to supplement Piscataquis River flows at the Howland hydro-electric station downstream. An ancillary procedure is to release water as required during low flow periods to supply the intake to the Milo Water District. In addition, an effort is made to maintain Sebec Lake at approximate flashboard crest from July 1 to September 1 in deference to the Sebec Camp Owners Association.

### 1.3 PERTINENT DATA

a. Drainage Area - 327 square miles of flat and moderately rolling wooded terrain.

b. Discharge at Dam Site - Discharge is from over the spillway and through the two sluice gates. Elevations shown below are in feet referenced to NGVD datum.

1. Outlet Works (conduits):

Two 11-ft. wide by 10-ft. high sluice gates w/water at dam top el. 330.4	6,400 cfs (total, both gates)
--	----------------------------------

2. Maximum known flood at dam site:

March 20, 1936	11,400 cfs
----------------	------------

3. Ungated spillway capacity at top of dam el. 330.4

9,400 cfs w/flashboards 13,300 cfs w/o flashboards
---

4. Ungated spillway capacity at test flood el. 347.5 (controlled by tailwater)

30,400 cfs w/flashboards 31,100 cfs w/o flashboards
--

5. Gated spillway capacity at normal pool el. 323

N/A

The left abutment has a top elevation of 325.0, a maximum of 16 feet in height above the streambed.

58 feet of the spillway has a crest elevation of about 322.2, while the remaining 120 feet is 1 foot lower. The entire spillway is normally operated at an elevation of about 323.0 using permanent flashboards.

The gate structure and right abutment (old powerhouse) has a top elevation of 330.4 and contains two 11-foot wide by 10-foot high steel wheeled sluiceways, both at an invert elevation of 309.1. Mounted above each gate is a steel hoist framework constructed to support a trolley-type lifting apparatus. Access to the gate structure is via the right embankment.

Elevations are in feet referenced to NGVD datum.

No instrumentation exists at this dam. There is a USGS stream gaging station on the Sebec River approximately 1,000 feet downstream of the dam.

c. Size Classification - LARGE - The dam impounds approximately 150,000 acre-feet with the pond level at the top of the dam, which at elevation 330.4 is about 21 feet above the streambed. According to the Recommended Guidelines, the dam is classified as large in size since its impoundment is greater than 50,000 acre-feet.

d. Hazard Classification - SIGNIFICANT - If the dam were to be breached, there is potential for considerable downstream damage and possible loss of a few lives. Two or three seasonally occupied structures approximately 3.8 miles downstream of the dam would be flooded to a depth of about 1 foot by the sudden 2-foot increase in stage from 5 to 7 feet above the streambed.

A breach under dry weather conditions would result in a sudden 10-foot increase in stage immediately downstream of the dam, from 5 to 15 feet. This would flood two seasonally occupied structures approximately 400 yards downstream of the dam to a depth of about 4 feet.

e. Ownership - Bangor Hydro-Electric Company  
33 State Street  
Bangor, Maine 04401  
Attn: Mr. Douglas Morrell  
(207)945-5621

f. Operator - Mr. Merle Doyer  
Bangor Hydro-Electric Company  
West Main Street  
Milo, Maine 04463  
(207)943-7371

PHASE I INSPECTION REPORT  
SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

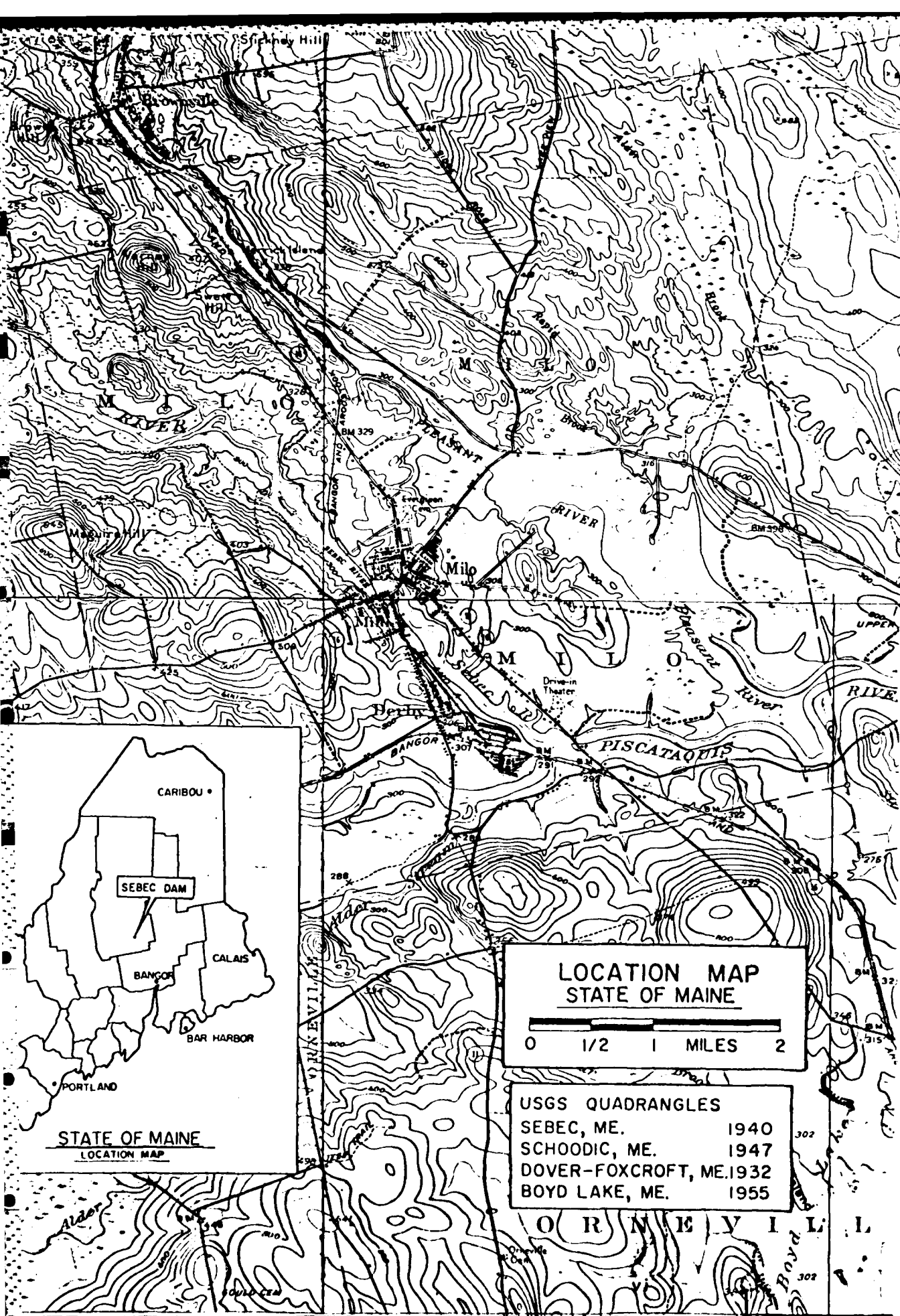
a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. James W. Sewall Company has been retained by the New England Division to inspect and report on selected dams in the State of Maine. Authorization and notice to proceed were issued to James W. Sewall Company under a letter of April 2, 1980 from William E. Hodgson, Jr. Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0051 has been assigned by the Corps of Engineers for this work.

- b. Purpose of Inspection Program - The purposes of the program are to:
1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.
  2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
  3. To update, verify and complete the *National Inventory of Dams*.

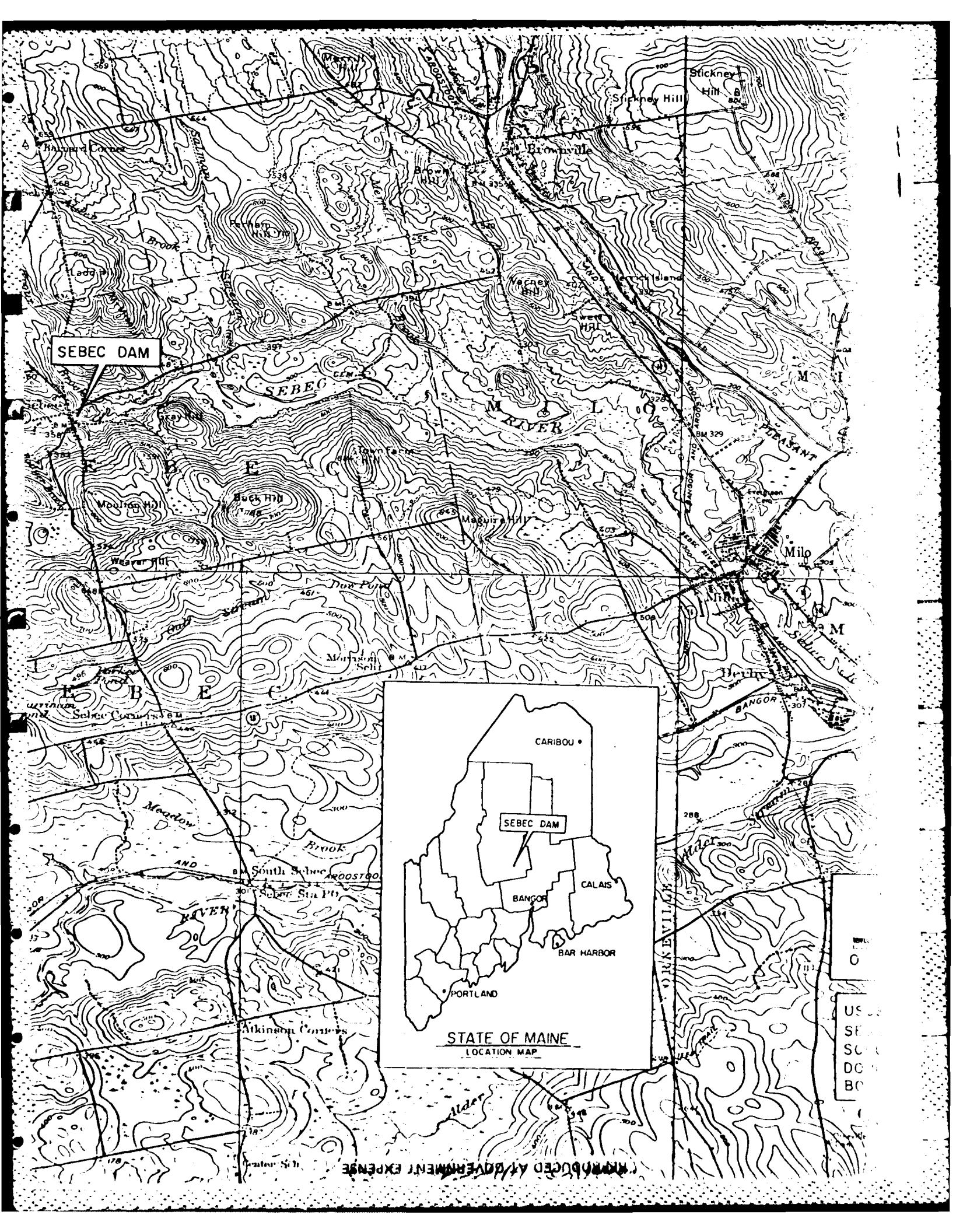
1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the headwaters of the Sebec River about 9.2 miles upstream from its confluence with the Piscataquis River in the Town of Sebec, County of Piscataquis, State of Maine. The dam is shown on the Sebec, Me. USGS Quadrangle Map having coordinates latitude N45°16.2' and longitude W69°07.0'.

b. Description of Dam and Appurtenances - The existing dam, founded on bedrock, is a roughly "Z" shaped concrete-capped timber crib structure, 276 feet in overall length, including a 20-foot long abutment section on the left, a 178-foot spillway section, a 20-foot long fish passage on the right, and the 58-foot long foundation of a now-defunct hydro-electric generating station, containing two outlet sluice gates, which forms the right abutment.







SEBEC DAM

SEBEC

SEBEC RIVER

Stickney Hill

Brown Hill

Maguire Hill

Milo

BANGOR

CARIBOU

SEBEC DAM

CALAIS

BANGOR

BAR HARBOR

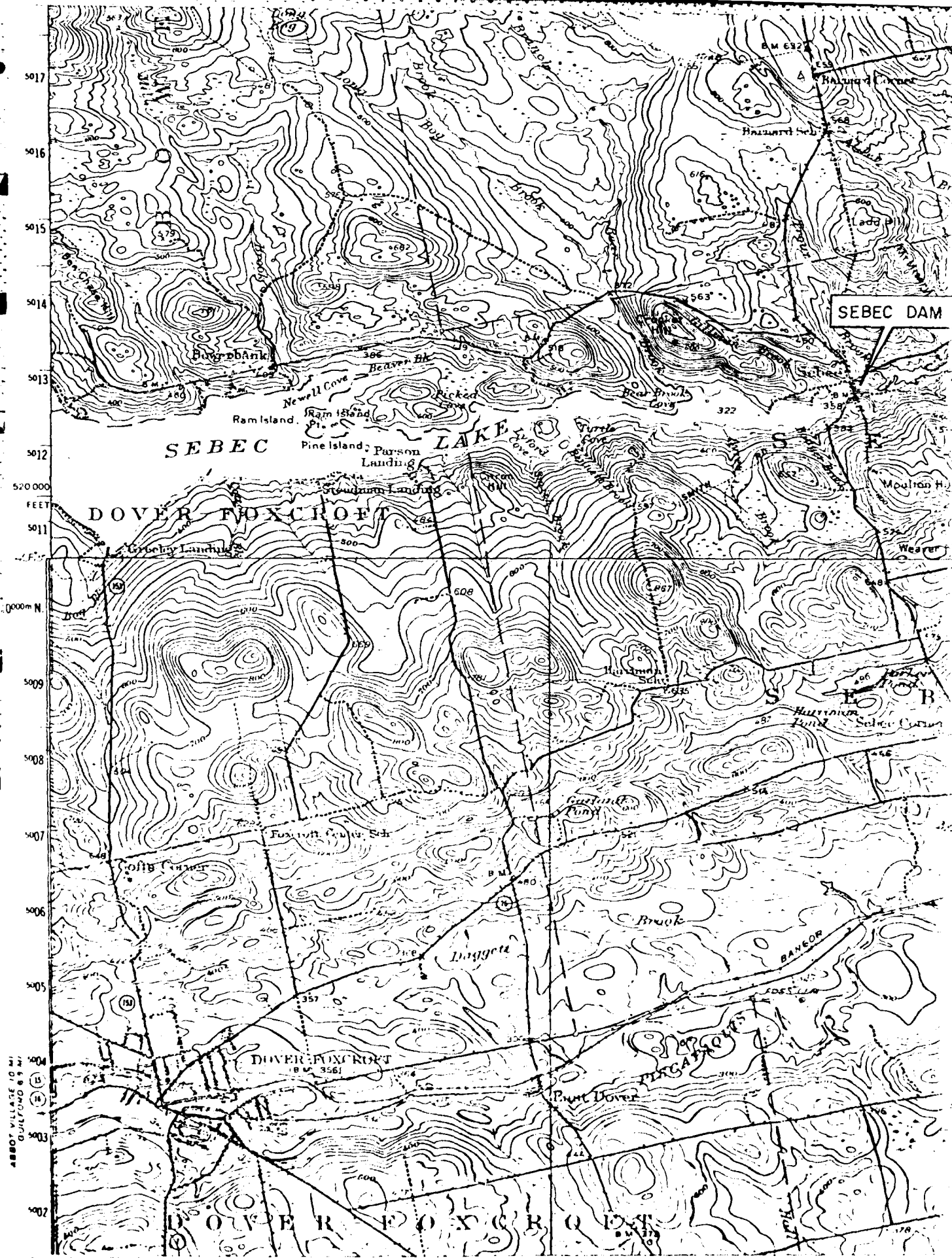
PORTLAND

STATE OF MAINE

LOCATION MAP

US  
SE  
SU  
DO  
BO

REPRODUCED AT GOVERNMENT EXPENSE





OVERVIEW PHOTO

U.S. ARMY ENGINEER DIV. NEW ENGLAND  
CORPS OF ENGINEERS  
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY  
CONSULTANTS  
OLD TOWN, MAINE

NATIONAL PROGRAM OF  
INSPECTION OF  
NON-FED. DAMS

Sebec Dam - ME 00163

Sebec, Maine

February 1, 1981

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d. Reservoir Area - There are no indications of instability along the banks of the reservoir in the vicinity of the dam. The reservoir is only 50 yards wide where it is spanned by the highway bridge 30 yards upstream of the dam. Continuing upstream, Sebec Lake gradually widens to its maximum width of two miles which occurs near the upper end of its eleven mile length.

e. Downstream Channel - At the left of the old power station is an abandoned concrete fishway which also serves as a training wall below the power station, as seen on the right side of Photo 8. This concrete has moderate spalling and some efflorescence. Extending about 25 yards from the lower end of the fishway is an earth filled, stone masonry wall separating the tailrace from the main river channel as shown in Photo 9. This wall is about 10 feet wide and 8 feet high with numerous small trees growing on it. This wall is in good condition. The main downstream channel is the original riverbed, as seen in Photo 9. This is stony with areas of exposed bedrock. The banks of the river are wooded.

The first crossing of the Sebec River downstream of this dam is the Bangor and Aroostook Railroad Bridge in Kilo. This is about seven miles downstream and is shown in Photo 10.

About 1,000 feet downstream of the railroad bridge, Main Street, Kilo, is carried over the Sebec River on two bridges with an island between them. These are shown in Photos 11 and 12. Just upstream westerly of the two bridges is a timber crib dam seen in the foreground of Photo 13.

### 3.2 EVALUATION

On the basis of the visual examination this dam is considered to be in fair condition.

Continued spalling and eroding of the concrete of the old power station could endanger the integrity of the structure, possibly resulting in the uncontrolled release of the waters of Sebec Lake.

## SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

### 4.1 OPERATIONAL PROCEDURES

a. General - The basic operating procedure is to follow an operations rating curve by holding or releasing water as needed for power generation at Howland Power Station about 25 miles downstream. An accessory procedure is to release water as needed to supply the intake for the Hilo Water District. In addition, an effort is made to hold the level of Sebec Lake fairly constant from July 1 to September 1 in deference to the Sebec Camp Owners Association.

During periods of heavy flow, the site is visited by operating personnel about every other day. During other periods, the visits are approximately biweekly.

b. Warning System - No warning system is known to exist.

### 4.2 MAINTENANCE PROCEDURES

a. General - The dam receives no regular maintenance, but rather on an "as necessary" basis.

b. Operating Facilities - Maintenance of operating facilities is minimal.

### 4.3 EVALUATION

The operation and maintenance procedures at this dam are inadequate to ensure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure as well as a warning system to follow in the event of an emergency at the dam.

## SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

### 5.1 GENERAL

The project is a low surcharge - large storage timber crib structure, originally constructed and used for hydro power production, but currently used for stream regulation and water storage.

The tributary watershed consists of 327 square miles of undeveloped terrain which is virtually 100% wooded. With NGVD elevations ranging from 320 to over 2600 feet, portions of the watershed are very steep, but average watershed slope is approximately 3%. Further, the watershed contains numerous lakes and ponds, the aggregate surface area of which comprises about 10% of the watershed area. For purposes of hydrologic computation, the watershed is thus considered relatively flat.

Adjacent to and upstream of the dam, a roadway bridge crosses the approach channel with its bottom steel about 8.2 feet above the spillway crest. This bridge produces a hydraulic effect at higher flows.

Hydraulics computations indicate that downstream channel characteristics would control discharge from the dam at flows in excess of 15,000 cfs. Occurrence of the test flood would completely inundate the dam by virtue of the backwater from the downstream channel. The full spillway would accommodate about 22% of the routed Test Flood outflow from the dam, but would accommodate about 63% of the maximum flow which could be controlled by the dam.

### 5.2 DESIGN DATA

No design data are known to exist for this project.

### 5.3 EXPERIENCE DATA

The maximum known flood at the dam site occurred March 20, 1936, producing a peak outflow of 11,400 cfs. The dam reportedly failed on that date, releasing a major fraction of the storage in Sebec Lake, and contributing significantly to the severe downstream damages incurred during the general flooding at the time. No detailed information concerning the exact nature or extent of the failure was located.

### 5.4 TEST FLOOD ANALYSIS

The Test Flood for this significant hazard large size dam is the Probable Maximum Flood (PMF). Peak inflow to Sebec Lake is 85,000 cfs (260 csm) and was determined using the "Flat and Coastal" guide curve of the "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March, 1978. Peak outflow is 43,000 cfs with the water elevation 26.5 feet above the spillway crest and the initial reservoir level assumed at the permanent flashboard crest (el. 323 NGVD). Based upon hydraulics computations, the spillway capacity is 9,400 cfs which is approximately 22% of the routed Test Flood outflow from Sebec Dam. Test Flood outflow is controlled by the reach directly

downstream of the dam, the backwater from which would, at flows in excess of about 15,000 cfs, submerge the dam. The spillway capacity is thus about 68% of that flow on which the dam would act as a control.

#### 5.5 DAM FAILURE ANALYSIS

Utilizing the April, 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow with the pool initially at the top of the dam (el. 330.4 NGVD) would be approximately 13,000 cfs, an increase of 3,600 cfs above the estimated 9,400 cfs pre-failure flow. The breach would cause an increase in stage immediately downstream from the dam from about 18 feet to 22 feet, which would likely cause little further damage as two seasonal residences in the area would be destroyed by the pre-failure flow. Further downstream, approximately 3.8 miles from the dam, the sudden increase in stage from 5.2 feet to 6.8 feet would be sufficient to flood two or three seasonal residences to a depth of about 1 foot. Further downstream, estimated stage increases of 1 foot or less would create little damage beyond that caused by the pre-failure flow.

The consequences of a "dry weather" failure with the water level initially at the top of the flashboards (323 NGVD) was also investigated. A pre-failure flow of about 300 cfs emanating from one sluice gate was assumed. The peak failure outflow would be 6,600 cfs. The sudden increase in stage from 5 feet to 15 feet immediately downstream from the dam would flood two seasonal residences in the area to a depth of about 4 feet. Further downstream, resulting increases in stage would be expected to cause little damage.

There is potential for considerable property damage and possible loss of a few lives, thus Sebec Dam has been classified as a "Significant Hazard" dam.



## SECTION 6: EVALUATION OF STRUCTURAL STABILITY

### 6.1 VISUAL OBSERVATION

The visual inspection of the dam indicates the following potential problem:

Continued spalling and eroding of the concrete of the old power station could endanger the integrity of the structure possibly resulting in the uncontrolled release of the storage contained in Sebec Lake.

### 6.2 DESIGN AND CONSTRUCTION DATA

No original design and construction data are available for the dam.

### 6.3 POST-CONSTRUCTION CHANGES

The rock-filled timber crib dam is shown on the plan of Sebec Village in the 1882 Colby Atlas. There was at that time a saw mill at the site. In about 1920, an attempt was made by the Boston Excelsior Co. of Milo, Maine, to construct a stone masonry and concrete dam, together with a power station, adjacent to and downstream of, the original timber-crib structure. The new dam reportedly failed as it was being filled and the timber crib dam was subsequently renovated and utilized in conjunction with the power station. The dam sustained damage in the 1936 flood and was subsequently repaired. On August 19, 1940, the powerhouse burned. The dam was at that time owned by Maine Public Service Company. The structure has since been acquired by the Bangor Hydro-Electric Company and has, since 1960, undergone considerable renovation work, including sheet piling, concrete cap and aprons, and new sluice gates.

### 6.4 SEISMIC STABILITY

The dam is located in Seismic Zone 2, and in accordance with the recommended Phase 1 guidelines does not warrant seismic investigation.

## SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

- a. Condition - Based upon the visual inspection, the dam is judged to be in fair condition.
- b. Adequacy of Information - Due to the lack of design and construction data for this dam, the assessment of safety is based solely on the visual inspection.
- c. Urgency - The remedial measures and recommendations presented below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

### 7.2 RECOMMENDATIONS

The owner should engage a qualified registered engineer to further assess the spalled and eroded concrete of the old power station and fishway and submit recommendations for the repair and rehabilitation of the same.

The owner should implement all recommendations by the engineer.

### 7.3 REMEDIAL MEASURES

- a. A program of **annual** technical inspection, with repairs as necessary, should be instituted by the owner.
- b. The dam should be monitored during flood periods and a formal downstream warning system, to be implemented in the event of an emergency at the dam, should be developed by the owner.
- c. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

### 7.4 ALTERNATIVES

This study has identified no practical alternative to the above recommendations.

APPENDIX A  
VISUAL CHECK LIST WITH COMMENTS

# VISUAL INSPECTION CHECKLIST PARTY ORGANIZATION

PROJECT Sugar Dam

DATE Nov. 4, 1980

TIME 9:00

WEATHER Clear

W.S. ELEV.          U.S.          DN.S.         

## PARTY:

- |  |   |
|--|---|
| 1. <u>Stanley, J. M. Chief</u>             | 6. <u>                                </u>  |
| 2. <u>Boone, J. H. Chief</u>               | 7. <u>                                </u>  |
| 3. <u>Boone, J. H. Chief</u>               | 8. <u>                                </u>  |
| 4. <u>Boone, J. H. Chief</u>               | 9. <u>                                </u>  |
| 5. <u>                                </u> | 10. <u>                                </u> |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Location and Elevation</u>	<u>S.D.M. J.H. Boone</u>	<u>S.D.M. J.H. Boone</u>
2. <u>Location and Elevation</u>	<u>S.D.M. J.H. Boone</u>	<u>S.D.M. J.H. Boone</u>
3. <u>Location and Elevation</u>	<u>S.D.M. J.H. Boone</u>	<u>S.D.M. J.H. Boone</u>
4. <u>Location and Elevation</u>	<u>S.D.M. J.H. Boone</u>	<u>S.D.M. J.H. Boone</u>
5. <u>                                </u>	<u>                                </u>	<u>                                </u>
6. <u>                                </u>	<u>                                </u>	<u>                                </u>
7. <u>                                </u>	<u>                                </u>	<u>                                </u>
8. <u>                                </u>	<u>                                </u>	<u>                                </u>
9. <u>                                </u>	<u>                                </u>	<u>                                </u>
10. <u>                                </u>	<u>                                </u>	<u>                                </u>

PROJECT Chico DamDATE 10/1/79PROJECT FEATURE Concrete and Timber DamNAME James H. JonesDISCIPLINE Structural EngineeringNAME James H. Jones

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	<i>Concrete and timber dam with associated hydroelectric plant.</i>
Crest Elevation	<i>Main section of dam and hydro plant founded on glacial till on right abutment. Left abutment on glacial till.</i>
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	<i>None observed.</i>
Vertical Alignment	<i>Good</i>
Horizontal Alignment	<i>Good</i>
Condition at Abutment and at Concrete Structures	<i>Condition at abutment contact is good.</i>
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	<i>N.A.</i>
Sloughing or Erosion of Slopes or Abutments	<i>N.A.</i>
Rock Slope Protection - Riprap Failures	<i>N.A.</i>
Unusual Movement or Cracking at or Near Toe	<i>N.A.</i>
Unusual Embankment or Downstream Seepage	<i>N.A.</i>
Piping or Boils	<i>N.A.</i>
Foundation Drainage Features	<i>N.A.</i>
Toe Drains	<i>N.A.</i>
Instrumentation System	<i>N.A.</i>
Vegetation	<i>N.A.</i>

# PERIODIC INSPECTION CHECKLIST

PROJECT Dam DATE 10/10/10  
 PROJECT FEATURE    NAME     
 DISCIPLINE    NAME   

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u> Crest Elevation Current Pool Elevation Maximum Impoundment to Date Surface Cracks Pavement Condition Movement or Settlement of Crest Lateral Movement Vertical Alignment Horizontal Alignment Condition at Abutment and at Concrete Structures Indications of Movement of Structural Items on Slopes Trespassing on Slopes Sloughing or Erosion of Slopes or Abutments Rock Slope Protection - Riprap Failures Unusual Movement or Cracking at or Near Toes Unusual Embankment or Downstream Seepage Piping or Boils Foundation Drainage Features Toe Drains Instrumentation System Vegetation	<i>Time limited</i>

PROJECT S. ...DATE March 1987PROJECT FEATURE Intake StructureNAME ...DISCIPLINE June ...NAME ...

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p>Slope Conditions</p> <p>Bottom Conditions</p> <p>Rock Slides or Falls</p> <p>Log Boom</p> <p>Debris</p> <p>Condition of Concrete Lining</p> <p>Drains or Weep Holes</p> <p>b. Intake Structure</p> <p>Condition of Concrete</p> <p>Stop Logs and Slots</p>	<p><i>Adjacent to the right abutment and upstream of the intake gate there is a concrete training wall which is in good condition.</i></p> <p><i>Concrete masonry shows amount of spalling with some erosion and efflorescence</i></p>

## PERIODIC INSPECTION CHECKLIST

PROJECT \_\_\_\_\_

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

DISCIPLINE Technical Engineering


NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	<u>The Control Tower</u>
a. Concrete and Structural General Condition Condition of Joints Spalling Visible Reinforcing Rusting or Staining of Concrete Any Seepage or Efflorescence Joint Alignment Unusual Seepage or Leaks in Gate Chamber Cracks Rusting or Corrosion of Steel	<u>N.A.</u>
b. Mechanical and Electrical Air Vents Float Wells Crane Hoist Elevator Hydraulic System Service Gates Emergency Gates Lightning Protection System Emergency Power System Wiring and Lighting System	<u>N.A.</u>



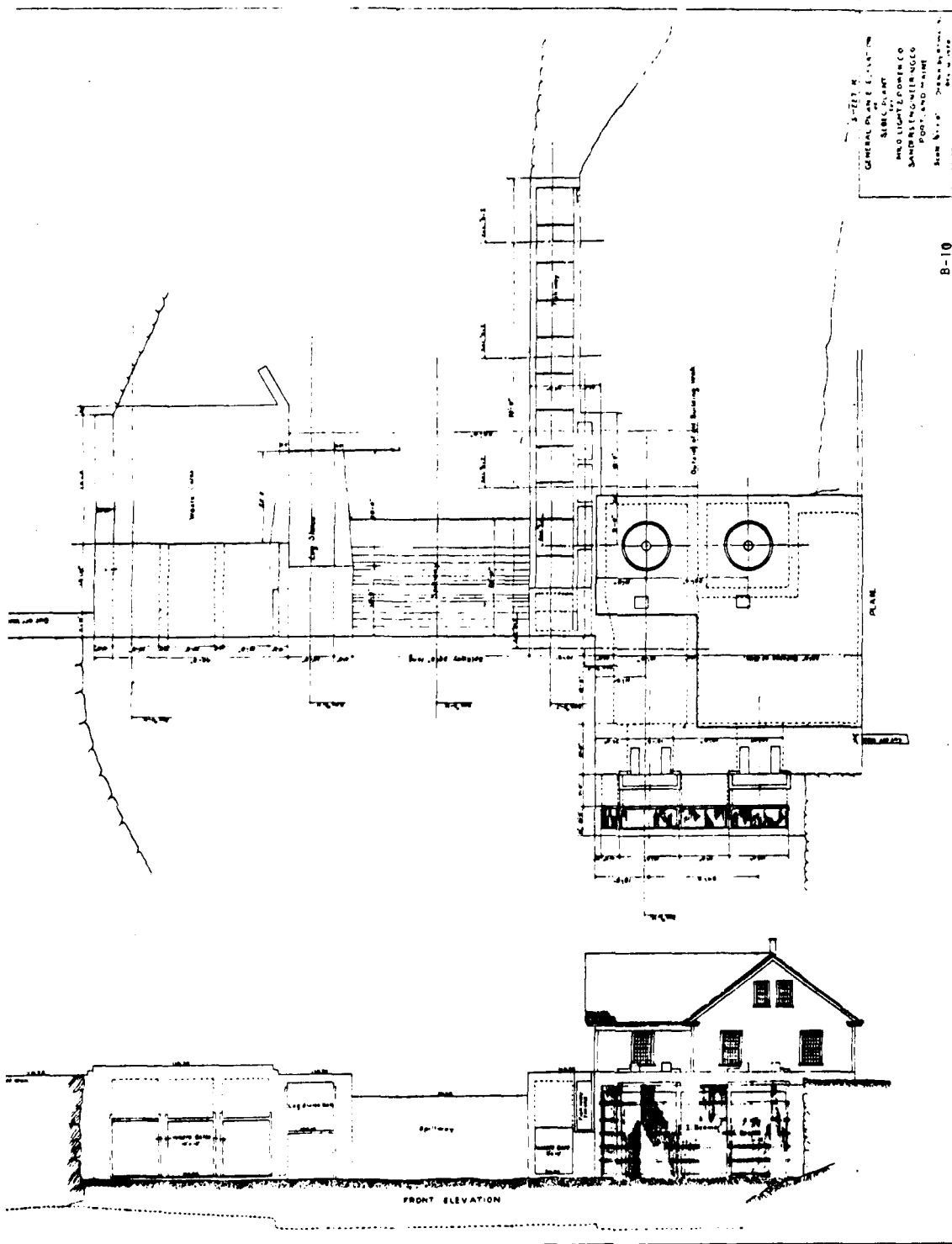
# PERIODIC INSPECTION CHECKLIST

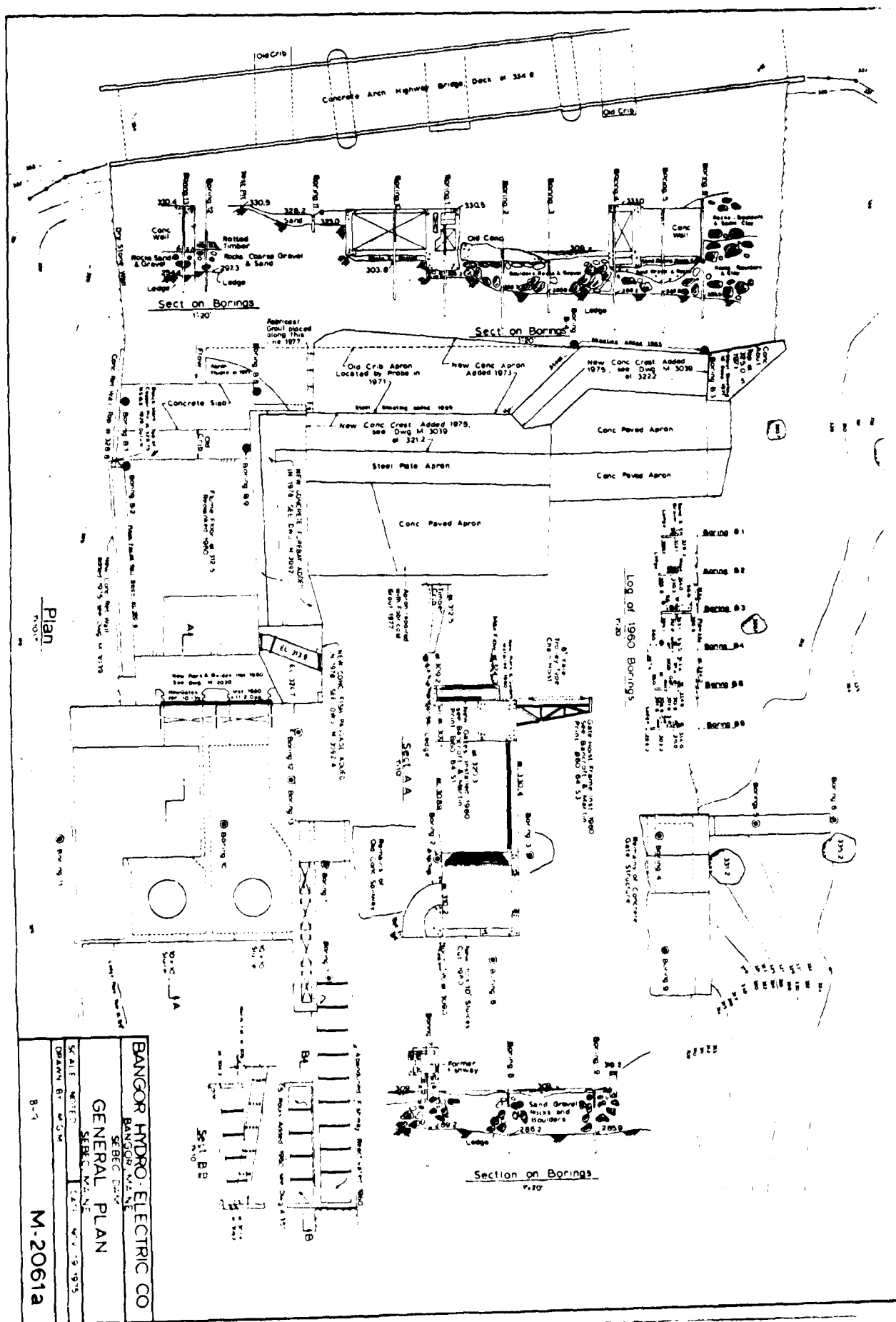
OBJECT \_\_\_\_\_ DATE \_\_\_\_\_  
 OBJECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_  
 DISCIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<p><u>LET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete</p> <p>rust or Staining on Concrete</p> <p>spalling</p> <p>erosion or Cavitation</p> <p>cracking</p> <p>Alignment of Monoliths</p> <p>Alignment of Joints</p> <p>Numbering of Monoliths</p>	

JECT \_\_\_\_\_ DATE \_\_\_\_\_  
 JECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_  
 CIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
LET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	
rust or Staining	None
Spalling	None
Erosion or Cavitation	None
Visible Reinforcing	None
Any Seepage or Efflorescence	There are no signs of seepage or efflorescence.
Condition at Joints	Good
Drain holes	Good
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Good





# Fishes

Salmon	Chain pickerel
Brook trout (squaretail)	Smelt
Lake trout (logano)	Eel
Smallmouth bass	White sucker
Yellow perch	Minnows
	Cusk

## Physical Characteristics

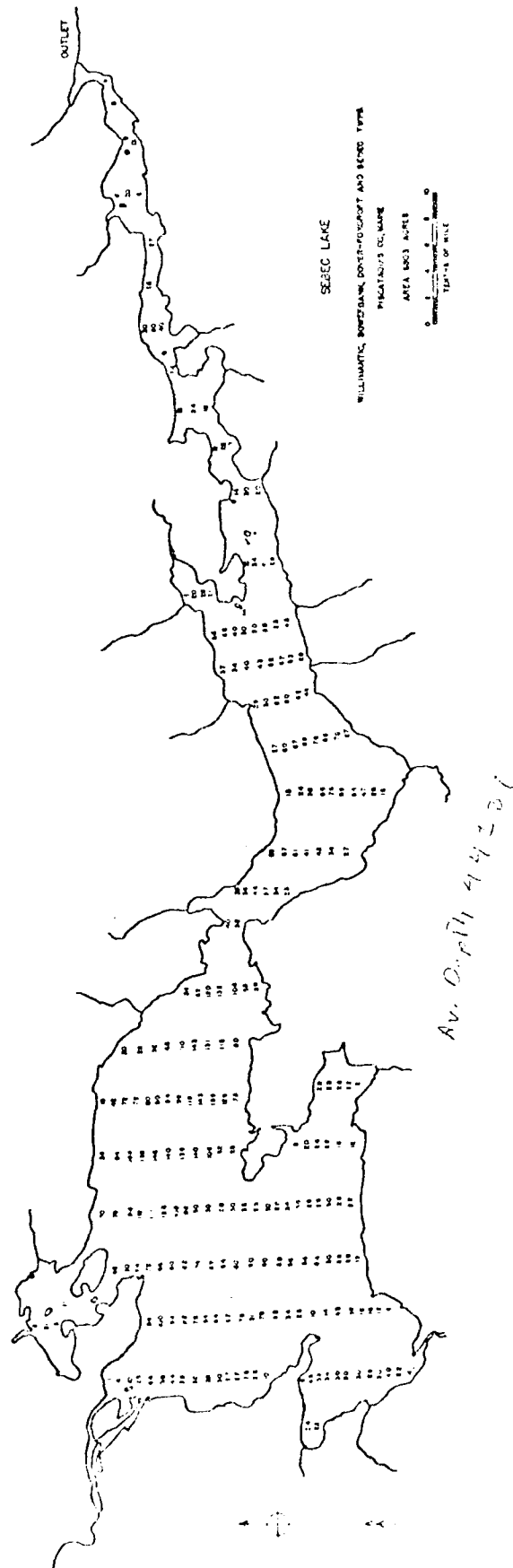
Area - 100 acres	Temperatures
Maximum depth - 155 feet	Surface - 75° F.
Principal fishery: Salmon, lake trout, smallmouth bass	150 feet - 45° F.

Sebec Lake provides ideal water quality for salmonids. A large portion of the water volume is cold with abundant dissolved oxygen at all depths in late summer.

In the past Sebec Lake was managed for its fine natural salmon production. However, in the years 1961 through 1966 lake trout were stocked in order to utilize the large amount of deep water and increase the fishing potential of the lake. These trout are now forming a well established population and are reproducing naturally in the lake. They are providing an excellent fishery in addition to the salmon for both summer and winter anglers.

Regulations controlling the size and bag limit of bass have been liberalized in hopes of reducing competition from this species. Presently the minimum length limit for salmon is 12 inches, and allows anglers to take advantage of large numbers of chinook that are slow to reach the normal 14-inch minimum length.

Survey 1 - 1950  
 (Revised 1953, 1970)  
 Maine Department of Inland Fisheries and Game  
 Publication Order Appropriation No. 4223.



# SELECOT RIVER BASIN

## SELECOT RIVER AT SELECOT, ME

LOCATION: Lat 44°14'12"N, Long 69°14'44"W, Piscataquis County, Me; Topic Unit (1) 20004, on right bank 1,000 ft (500 m) downstream from highway bridge and dam at outlet of Sebec Lake at Sebec.

DRAINAGE AREA: 347 mi<sup>2</sup> (847 km<sup>2</sup>).

PERIOD OF RECORD: October 1924 to current year.

REVISED RECORDS: RSP 1171: Drainage area, 1186(M). RSP 1301: 1925.

GAGE: Water-stage recorder. Datum of gage is 296.3 ft (90.31 m) above mean sea level. Prior to June 22, 1942, at site on opposite bank 60 ft (18 m) downstream at same datum.

REMARKS: Records good except those for period of no gage height record, which are fair. Flow regulated by Sebec Lake (Reservoir) in Piscataquis River basin and other reservoirs upstream. Several observations of water temperature and specific conductance were made during the year.

AVERAGE DISCHARGE: 53 years, 631 ft<sup>3</sup>/s (17.87 m<sup>3</sup>/s), 21.20 in/yr (605 mm/yr), unadjusted.

EXTREMES FOR PERIOD OF RECORD: Maximum discharge, 11,410 ft<sup>3</sup>/s (323 m<sup>3</sup>/s) Mar. 26, 1956, gage height, 14.46 ft (4.407 m), from rating curve extended to 11,410 ft<sup>3</sup>/s (323 m<sup>3</sup>/s) on basis of velocity-area studies; minimum, about 2 ft<sup>3</sup>/s (0.057 m<sup>3</sup>/s) Oct. 14-15, 1950, gage height, 0.80 ft (0.244 m), when gates in dam were closed.

EXTREMES FOR CURRENT YEAR: Maximum discharge, 2,640 ft<sup>3</sup>/s (74.8 m<sup>3</sup>/s) Apr. 24, gage height, 6.04 ft (1.841 m); minimum daily, 77 ft<sup>3</sup>/s (2.18 m<sup>3</sup>/s) Oct. 20.

## DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977 MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	600	631	380	321	585	267	1690	1910	136	1550	245	285
2	590	656	374	316	450	271	1600	1810	142	1430	240	290
3	580	638	374	316	405	267	2040	1740	145	1040	245	290
4	570	669	354	307	400	197	2090	1630	148	477	245	280
5	560	1020	340	307	395	210	2080	1530	151	503	245	280
6	540	1250	330	303	390	209	2060	1430	154	434	245	280
7	491	1240	345	299	385	201	1960	1380	161	401	240	276
8	440	1200	457	299	375	193	1870	1280	168	390	236	267
9	457	1130	547	307	370	186	1800	1060	164	316	236	262
10	669	1020	565	307	365	186	1780	984	161	209	232	262
11	696	947	572	307	360	189	1780	969	164	205	236	262
12	676	890	566	307	355	205	1700	947	168	205	236	262
13	644	835	560	305	350	228	1430	819	158	205	236	262
14	638	782	534	305	345	340	1510	105	148	209	236	262
15	595	743	503	305	335	601	1600	105	148	209	236	480
16	560	702	465	300	335	911	1670	105	145	205	262	1110
17	497	676	474	300	325	1450	1750	110	139	213	290	1070
18	468	553	462	300	325	1550	1860	112	145	249	294	1040
19	193	457	434	300	320	1560	1540	120	154	249	290	1010
20	77	534	412	294	315	1500	2120	125	171	245	290	962
21	112	485	401	290	310	1380	2250	125	193	245	290	897
22	117	457	390	290	305	1260	2410	125	197	245	290	835
23	154	457	374	303	300	1170	2560	125	253	245	290	743
24	232	429	374	294	295	1100	2610	128	285	245	290	644
25	321	406	369	290	290	1060	2610	130	316	245	290	563
26	434	395	359	290	285	1070	2540	130	457	245	290	522
27	516	395	354	290	285	1070	2420	130	702	245	290	572
28	547	390	354	290	280	1100	2310	130	801	245	290	855
29	553	401	340	290	---	1110	2190	136	815	240	280	918
30	553	395	335	285	---	1170	2040	136	1260	240	280	977
31	566	---	330	425	---	1380	---	136	---	245	265	---
TOTAL	14646	20817	13049	9442	9835	23617	60620	19522	6349	11549	8180	17038
MEAN	472	694	421	305	351	762	2021	630	278	376	264	566
MAX	696	1250	572	425	585	1560	2610	1910	1260	1550	294	1110
MIN	77	390	330	285	280	186	1430	105	136	205	232	262
MEAN <sup>1</sup>	686	641	580	224	115	1005	2181	557	601	180	209	574
CFSM <sup>1</sup>	2.10	1.96	1.16	0.68	0.35	3.07	6.67	1.64	1.54	0.58	0.64	1.77
IN:1	2.42	2.18	1.34	0.79	0.37	3.34	7.44	1.89	2.05	0.67	0.74	1.98

CAL YR 1976 TOTAL 317198 MEAN 667 MAX 5210 MIN 77 MEAN<sup>1</sup> 866 CFSM<sup>1</sup> 2.65 IN:1 36.08  
WTR YR 1977 TOTAL 216764 MEAN 594 MAX 2610 MIN 77 MEAN<sup>1</sup> 612 CFSM<sup>1</sup> 1.87 IN:1 25.42

<sup>1</sup> Adjusted for change in contents in Sebec Lake.  
NOTE: No gage-height record Jan. 30 to Mar. 3.

26 Generators

No. of Units	Make	Date Installed	K. W. Per Unit	Voltage	Amp.	Capacity K.V.A.

27 Steam Plant Capacity                      K.W.                      H.P.

28 Fuel

29 Remarks

(PASTE PHOTO HERE)

30 Information furnished by R. E. Stratton Title Hyd. Engr.,  
Bangor Hydro-Electric Company

31 Information obtained by R. A. Ranger Date 9-28-1964  
PUC Engineer



10-28-80

**River**

Sebec River

at Sebec

**File No**

# APPLICATION FOR DAM REGISTRATION

Location:

County: Piscataquis

Municipality: Sebec

Name of Dam: Sebec Lake Dam

Name of Impoundment: Sebec Lake

Ownership:

Name of Owner: Banger Hydro-Electric Company

Address of Owner: 33 State St.

Bangor, Maine 04401

Telephone Number: 945-5621

Description of Dam

Type: Storage

Construction Material: Timber Crib with Concrete Decks

(Concrete, wood, earth)

Year Originally built: Unknown

Height: 12 Ft.

Spillway type: Overfalling & Gates

Impounding Capacity: 36800  
(Acres-feet)

Has Passage available?: Yes

Impoundment for which stored water is used: Ancient Flow of Piscataquis/Penobscot Rivers.

for Power Generation.

Most recent inspection by qualified engineer (Date): Fall 1972

Name of Engineer: Richard E. Grotton, General Engineer

State of Maine: Sebec

Dam Registration Number: 191

Date Received: 11/15/1972

Fee Paid: \$100.00

Qual Sheet Name: Sebec

Qual Sheet Number: 17-1

Name of Applicant: Banger Hydro-Electric Company

(If different from owner)

Address:

Telephone Number:

Year last major repair: 1975

Width: 250 Ft.

Spillway Width: Crest Length 170 Ft.

Drawdown available: 6  
(feet)

Installed Electrical Generating Cap: 0

SUMMARY OF DATA AND CORRESPONDENCE

<u>DATE</u>	<u>SUBJECT</u>
3-16-77	Dam registration sheet from Soil and Water Conservation Commission
	Dam Inventory sheet from P.U.C. and USGS
1882	Plan of Sebec Village from Colby Atlas
1977	Stream Flow Records at Sebec From USGS Water Resources Data for Maine Water, Year 1977
1970	Sebec Lake Survey and Chart by Department of Inland Fisheries and Game

SEBEC DAM

EXISTING PLANS

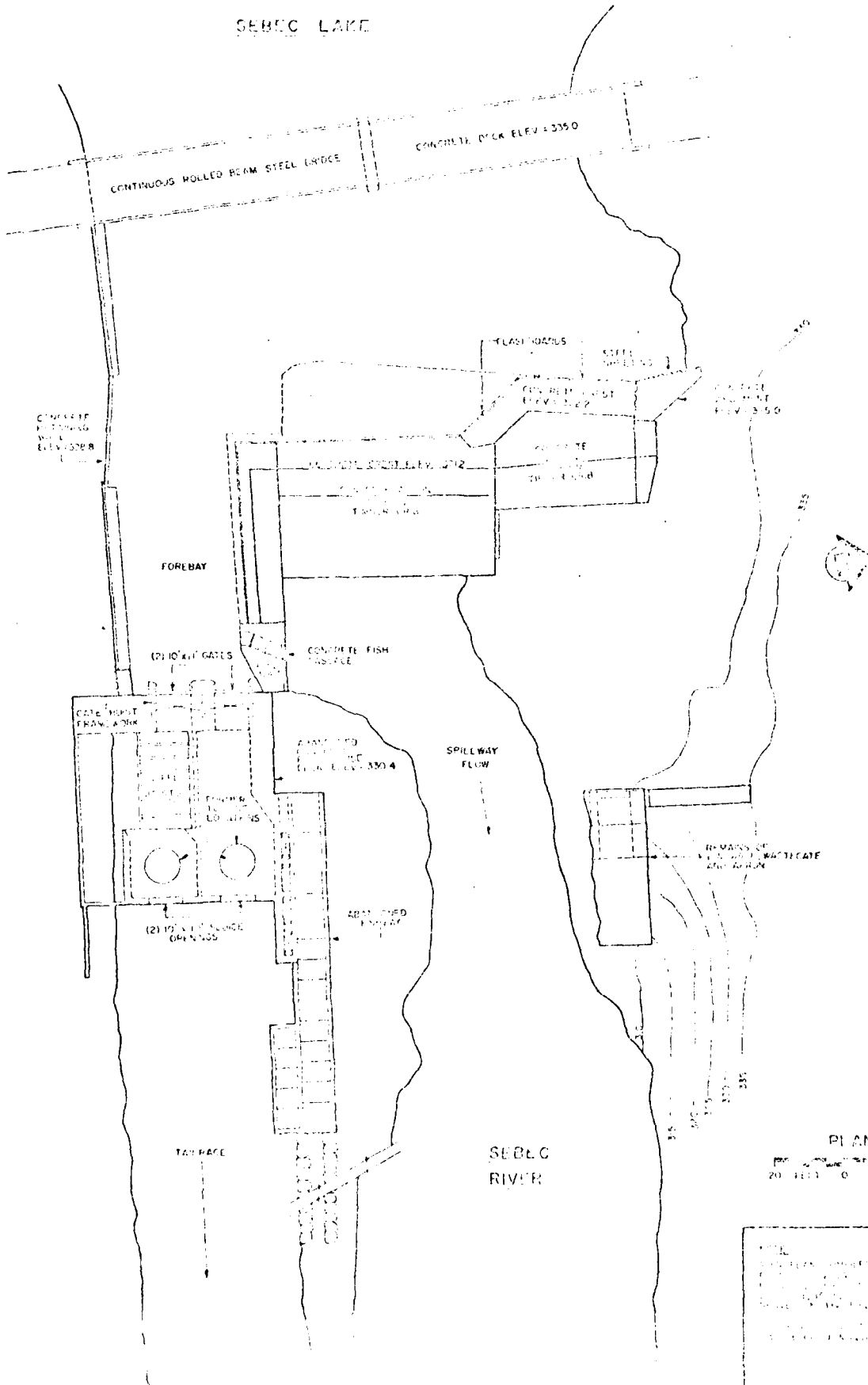
On file with Bangor Hydro-Electric Company:

1. Sebec Lake Dam, Proposed Concrete Forebay, Changes to Accommodate Fishway M-3092A, September 1, 1978
2. Sebec Lake Dam, Proposed Concrete Forebay, M-3092, August 29, 1977
3. Sebec Dam, General Plan, Sebec, Maine, M-2061A, Nov. 19, 1975
4. Sebec Dam, General Plan, Sebec, Maine, M-2061, January 23, 1961

On file with the Maine Office of Energy Resources:

1. Survey, Excavation and General Plan, Sebec Power Station and Dam for Boston Excelsior Co., Milo, Maine, August 20, 1920
2. Excavation for Dam and Tail Race, Sebec Power Station and Dam for Boston Excelsior Co., Milo, Maine, August 21, 1920
3. Plan and Section of Large Gates and Frames for Boston Excelsior Co., Milo, Maine, Dam at Sebec, Maine, September 1920
4. Plan of Station and Headgates, Sebec Plant for Milo Light and Power Co., December 30, 1920
5. Sections of Flume, Dam, etc., Sebec Plant for Milo Light and Power Co., December 15, 1920
6. Transverse Sections of Flume and Fishway, Sebec Plant for Milo Light and Power Co., January 12, 1921
7. Plan and Section of Fishway, Sebec Plant for Milo Light and Power Co., December 22, 1920
8. General Plan and Elevation, Sebec Plant for Milo Light and Power Co., December 13, 1920
9. Water Racks and Fishway Gates, Sebec Plant for Milo Light and Power Co., January 20, 1921
10. Waste Way and Log Sluice, Sebec Plant for Milo Light and Power Co., October 20, 1920

# SEBEC LAKE



US ARMY CORPS OF ENGINEERS  
NEW ENGLAND DISTRICT  
SEBEC LAKE  
SEBEC RIVER

PROJECT NO. 100-100-100-100  
DRAWING NO. 100-100-100-100  
DATE: 10/1/68  
BY: [Signature]  
CHECKED: [Signature]  
APPROVED: [Signature]

APPENDIX B  
ENGINEERING DATA

## PERIODIC INSPECTION CHECKS 35

PROJECT Survey DATE 1/1/72  
PROJECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_  
DISCIPLINE Geology NAME \_\_\_\_\_  
Geological Engineering Inc.

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

## PERIODIC INSPECTION CHECKLIST

PROJECT SECRET

DATE 10/10/68

PROJECT FEATURE \_\_\_\_\_

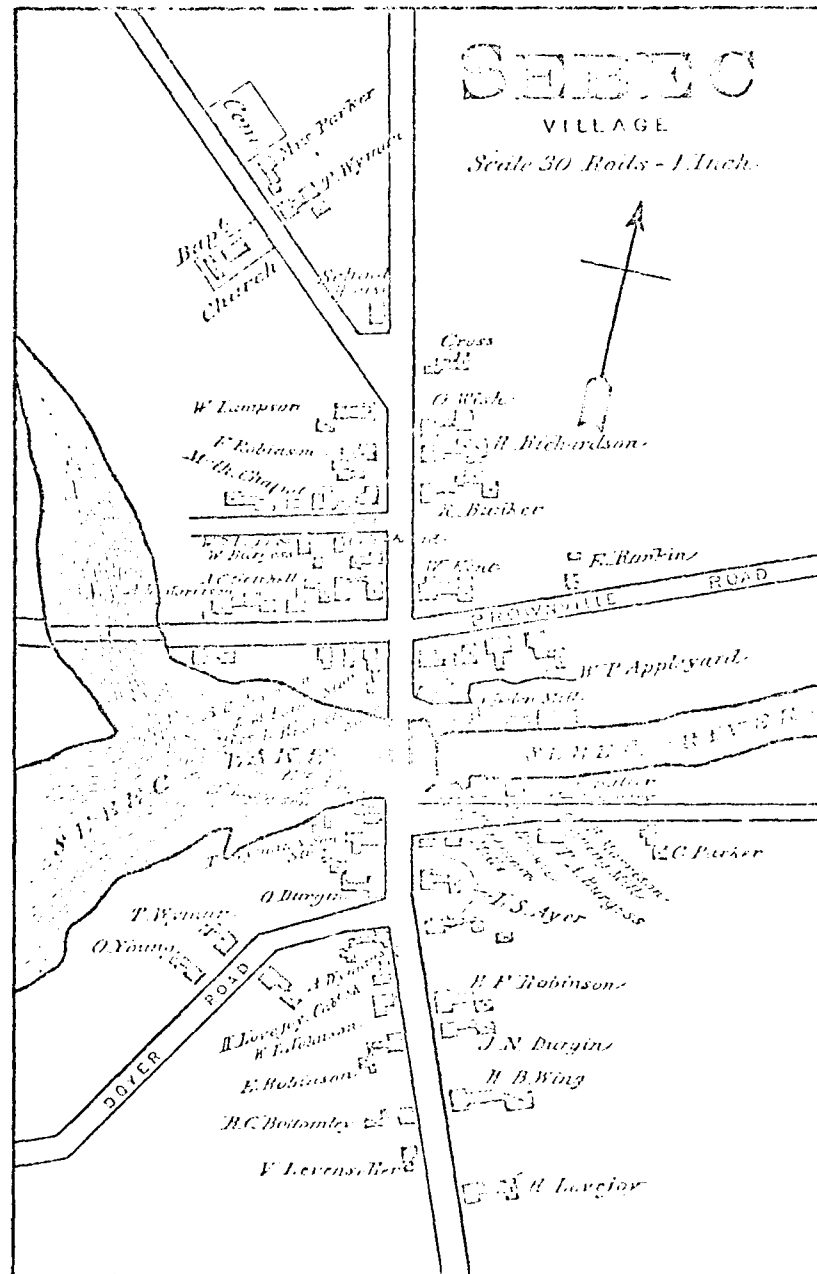
NAME John J. ...

DISCIPLINE

NAME SA. AL. AL.

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Some minor holes and cracks.
b. Weir and Training Walls	
General Condition of Concrete	Good - no visible deterioration
Rust or Staining	None - training walls
Spalling	None
Any Visible Reinforcing	No
Any Seepage or Efflorescence	None
Drain Holes	
c. Discharge Channel	Major hole in wall
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None of importance
Floor of Channel	Not there
Other Obstructions	None

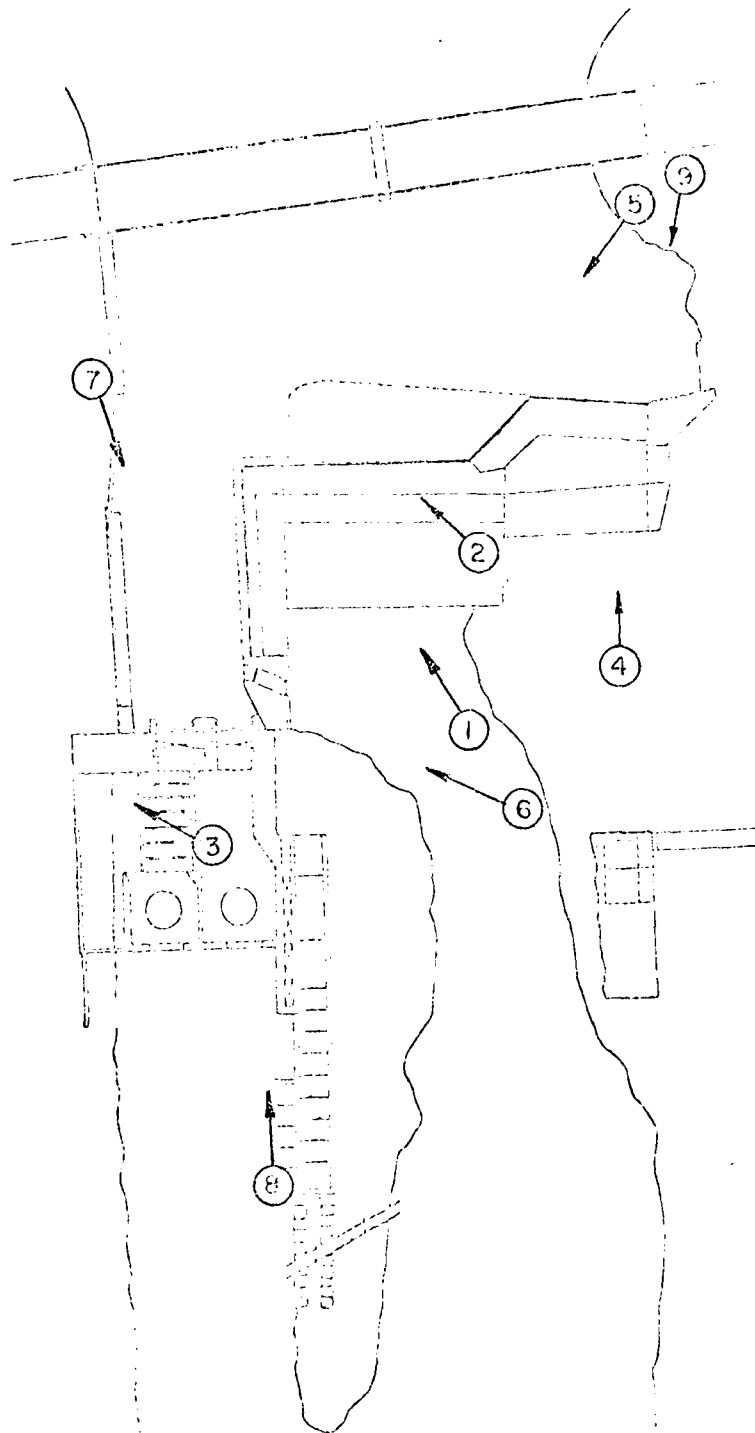




JAMES V. SEWELL CO.  
 CHARTERS  
 CHARTERED  
 PISCATAWAY COUNTY, 1922  
 SCALE - 1" = 30'

APPENDIX C  
DETAIL PHOTOGRAPHS

○ OVERVIEW  
↓



⑩ ⑪ ⑫ ⑬

TAKEN  
DOWNSTREAM  
↓

SSEFC DAM  
PHOTO LOCATION PLAN

APPENDIX D  
HYDRAULIC/HYDROLOGIC COMPUTATIONS



1. Rock-filled Timber Cribwork Visible Under Concrete



2. Downstream Side of Concrete Capped Spillway Crest.  
Concrete Apron at Left Foreground.

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CORPS OF ENGINEERS  
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY  
CONSULTANTS  
OLD TOWN, MAINE

NATIONAL PROGRAM OF  
INSPECTION OF  
NON-FED. DAMS

Sebec Dam

ME 00163

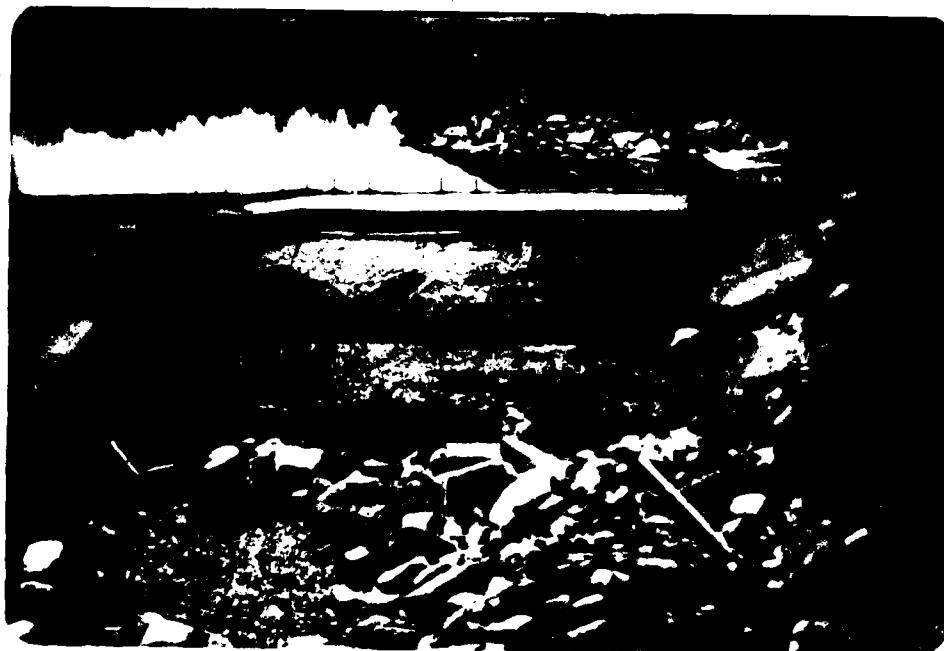
Sebec, Maine

Nov. 4, 1980

C-2



3. Exposed Bedrock at Right Abutment.  
Steel Joists Supported Former  
Powerhouse.



4. Area at Left Abutment

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WALTHAM, MASSACHUSETTS

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CONSULTANTS  
OLD TOWN, MAINE

NATIONAL PROGRAM OF  
INSPECTION OF  
NON-FED. DAMS

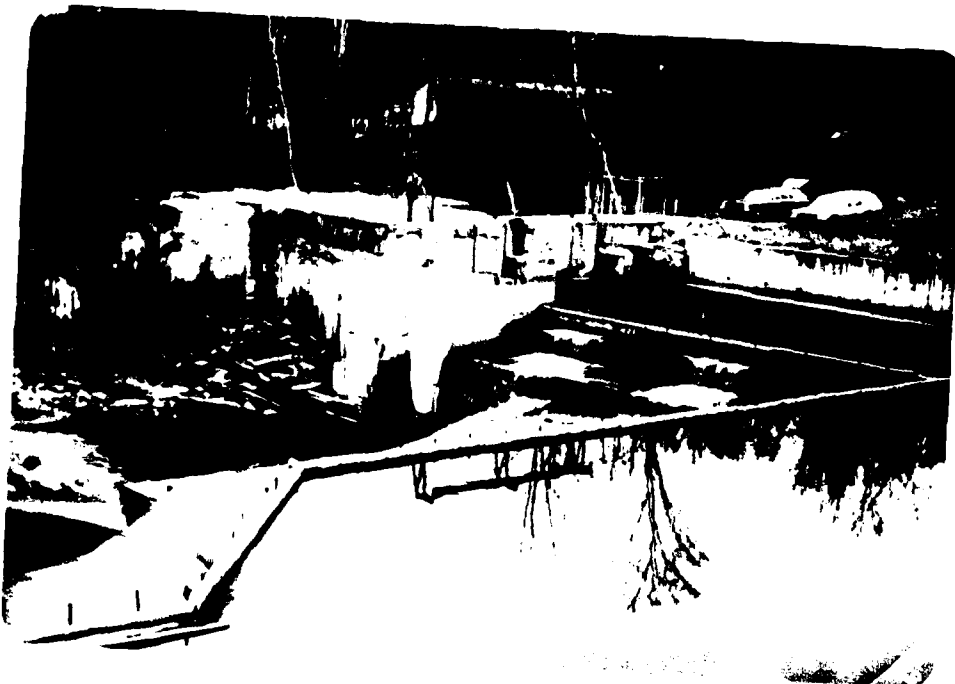
Sebec Dam

ME 00163

Sebec, Maine

Nov. 4, 1980

C-3



5. View of Forebay at Right, Gate Structure and Substructure of Former Power Station at Center Behind Uncompleted Fish Passage.



6. Uncompleted Fish Passage Adjacent to Power Station Substructure.

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WALTHAM, MASSACHUSETTS

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INSPECTION OF  
NON-FED. DAMS

Sebec Dam

ME 00163

Sebec, Maine

Nov. 4, 1980

C-4



7. Sluice Gates at End of Forebay



8. Outlet Openings in Downstream Foundation Wall of Power Station  
at Left, Abandoned Fishway at Right.

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WALTHAM, MASSACHUSETTS

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INSPECTION OF  
NON-FED. DAMS

Sebec Dam

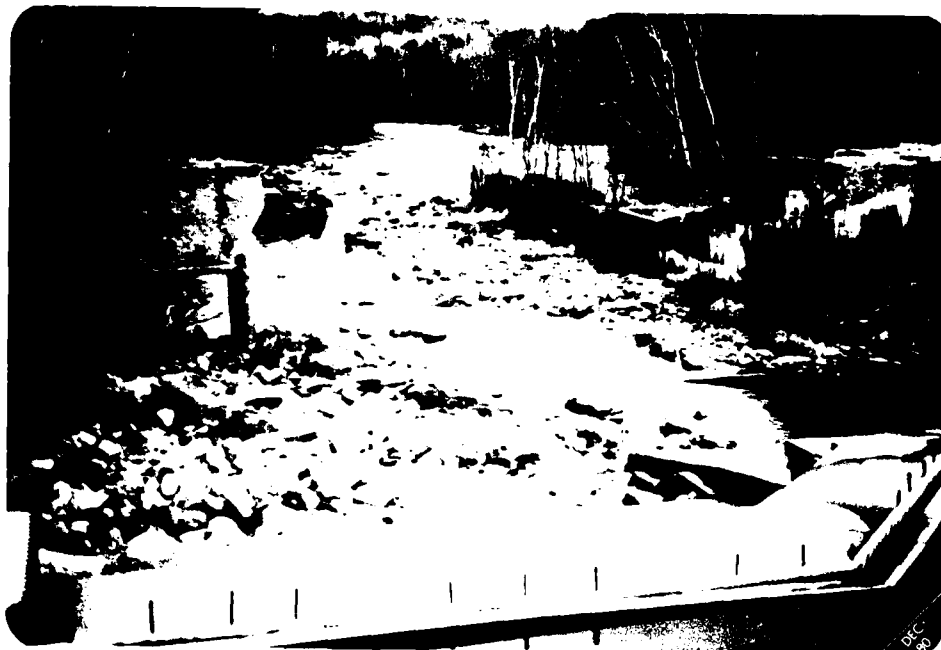
ME 00163

Sebec, Maine

Nov. 4, 1980

C-5





9. Original Riverbed Below Spillway Section of Dam. Abandoned Fishway and Masonry Training Wall at Right, Remains of Wastegate Section of Former Dam at Left Bank.



10. Railroad Bridge Crossing Sebec River In Milo.

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CORPS OF ENGINEERS  
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY  
CONSULTANTS  
OLD TOWN, MAINE

NATIONAL PROGRAM OF  
INSPECTION OF  
NON-FED. DAMS

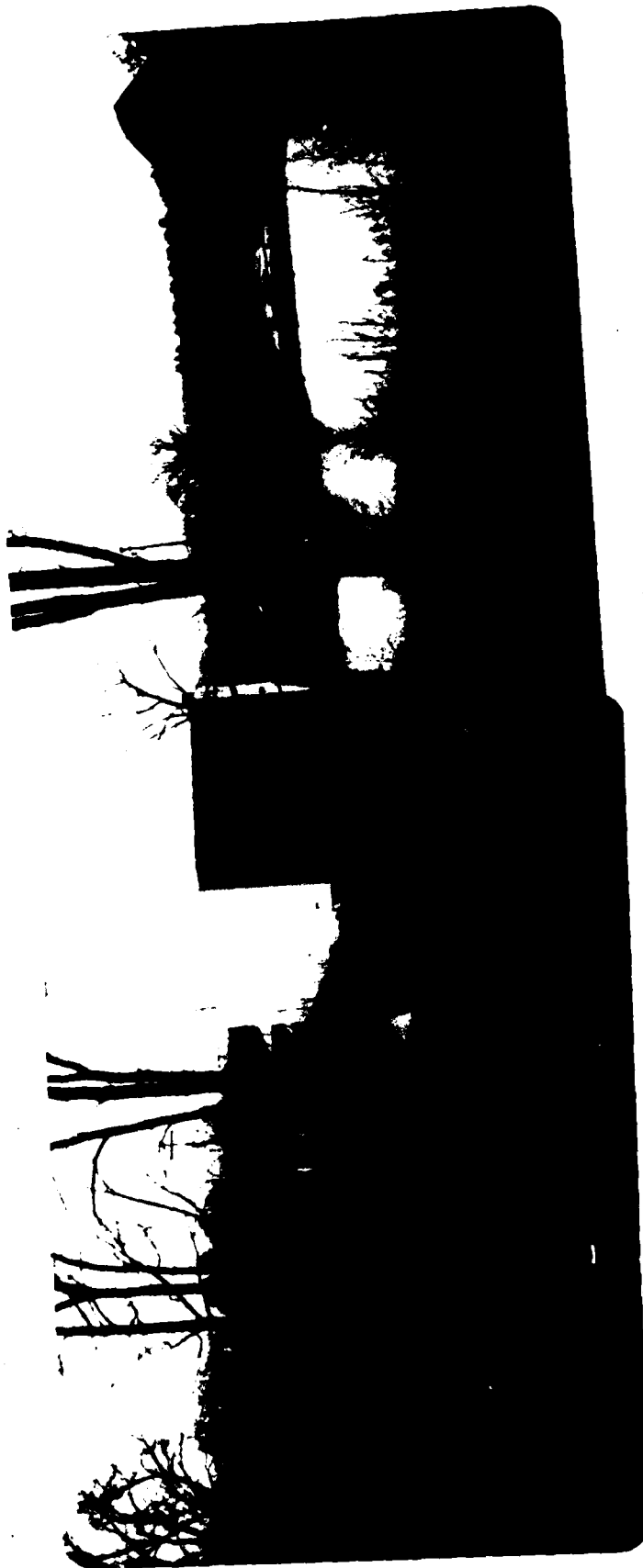
Sebec Dam

ME 00163

Sebec, Maine

Nov. 4, 1980

C-6



11. & 12. Two Bridges Carry Main Street, Milo, Over the Sebec River

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INSPECTION OF  
NON-FED. DAMS

Sebec Dam

ME 00163

Sebec, Maine

Nov. 4, 1980

C-7



13. Timber Crib Dam Above the Westerly Main Street Bridge in Milo.

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INSPECTION OF  
NON-FED. DAMS

Sebec Dam

ME 00163

Sebec, Maine

Nov. 4, 1980

C-8

DRAINAGE AREA  
327 SQ MILES

PRIMARY  
IMPACT  
AREA

SEBEC DAM

Doverford

HEOS QUADRANGLE  
MILLBROOK, ME. 1954  
SCALE 1:125,000

Station 1000 Job No. 1000

ited by \_\_\_\_\_ Checked by \_\_\_\_\_ Date 11-11-11

Location 11

Job No. 11-11-11

Designed by 11 Checked by 11 Date 11-11-11

*[Handwritten notes and calculations on graph paper, including the word "Location" and various numerical values.]*

JAMES M. SMITH, C. E. (P. E.)  
Civil and Survey Engineer

Page 1 of 1

Ion \_\_\_\_\_

I by \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

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ct Eng. Test. 18 Nov 54  
tation 21 Dec Job No. 21-10-10  
ted by W. J. Checked by W. J. Date 11-21-54

10-11-63

State - District - Street

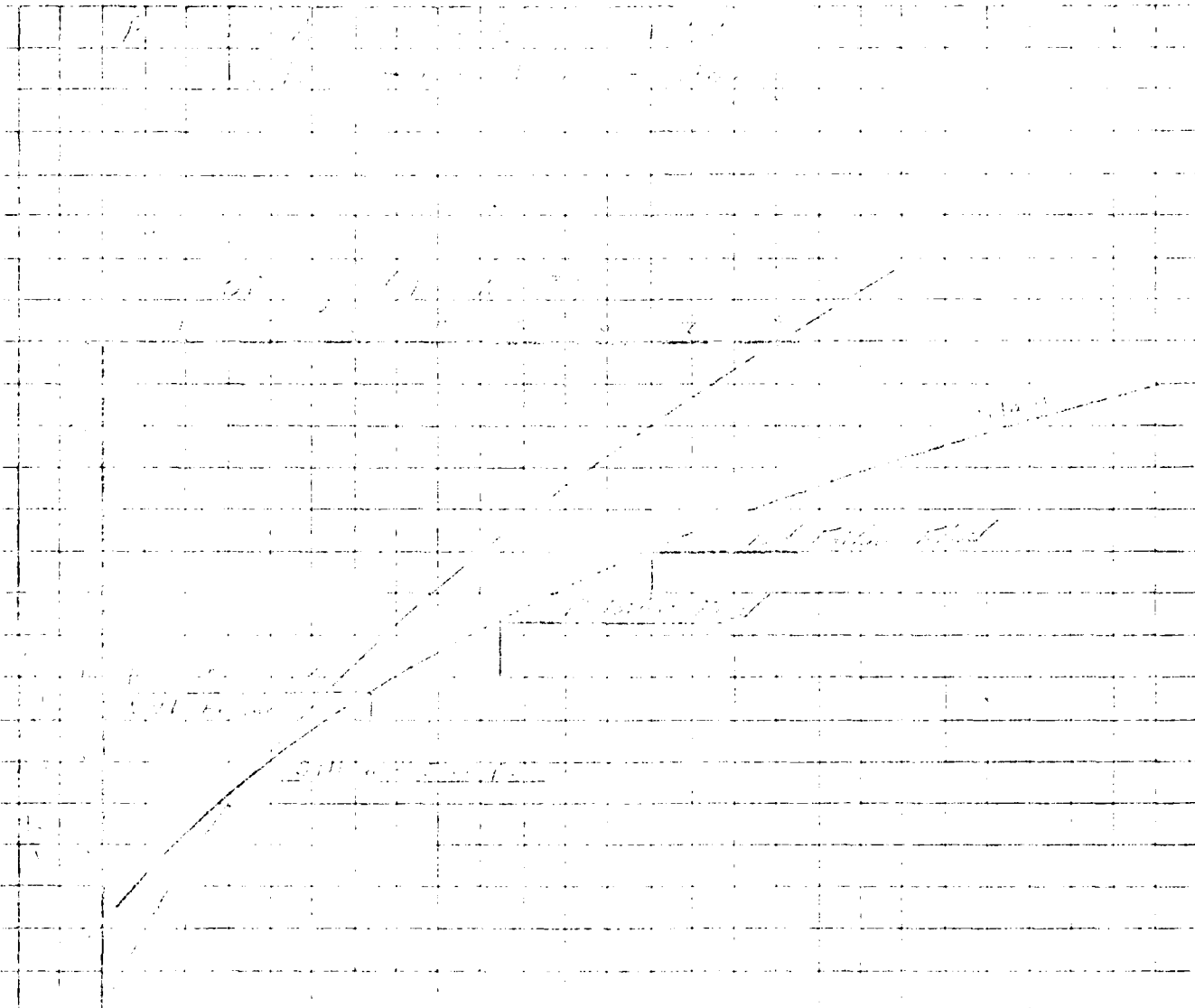
St. Louis, Mo. (A-57)

1947

ject \_\_\_\_\_

mutation

Submitted by SA [redacted] Checked by SA [redacted] Date 11/11/2011



*[Faint handwritten notes on lined paper]*

Object Imp. for M.F.D. 11-1  
 Computation 6 L. F. Job No. 11-1  
 Computed by C.H. Checked by C.H. Date 11-1

[illegible]

11. Trichostema Stem Dr. Long California  
1891 U.S. Bot. Gard.

12. Trichostema Stem Dr. Long California  
1891 U.S. Bot. Gard.

[illegible]

Subject Imp. Sewer at R. 1st St.

Computation Calc. Data and No. 10-1001

Computed by C. W. Checked by C. W. Date 11-2-1911

a) P. R. E. (D. H.) = 25.5 cfs

b) P. R. O. T. = 43.0 cfs

c) Fall Spilling = 9.0 cfs

about 32% of the total flow will be  
about 30% of the total flow will be

d) AT T. T. - flow = 25.5 cfs  
spilling, crest, etc. = 25.5 cfs

e) T. T. capacity of station with  
both of the falls of A. is 25.5 cfs  
at full spillage stage.

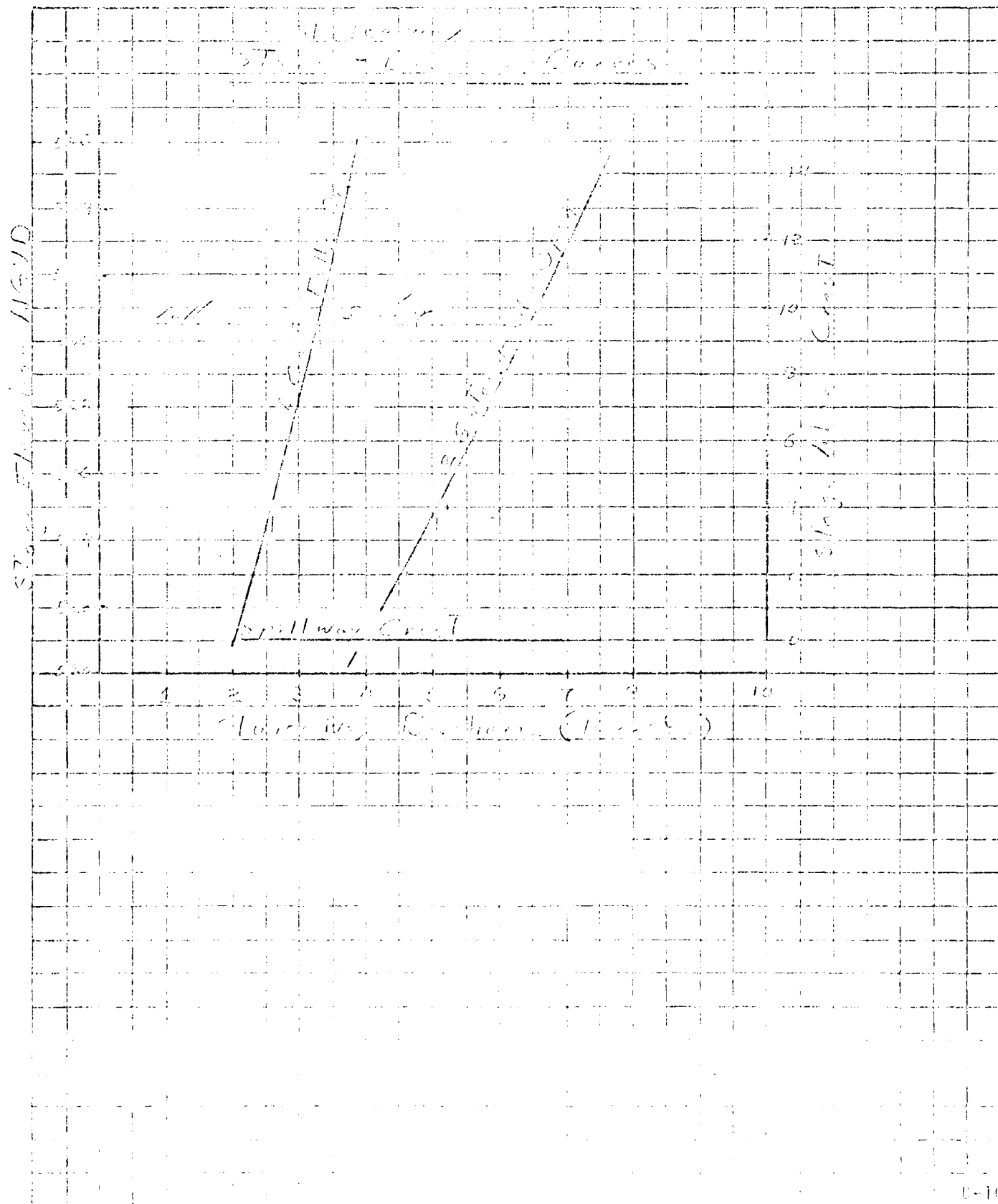
Computation Subs. De.

Job No. 958-01R

Computed by CO W

Checked by \_\_\_\_\_

Date 11-20-75



Subject Imp. Sewerage No. 1

Computation 11-1-12 Job No. 11-1-12

Computed by J. W. Checked by J. W. Date 11-1-12

c) Flow in pipe  
 $Q = 1.486 A R^{2/3} S^{1/2}$   
 $Q = 1.486 \times 1.57 \times 0.408^{2/3} \times 0.001^{1/2}$   
 $Q = 0.0017 \text{ cfs}$

d) Flow in pipe  
 $Q = 1.486 A R^{2/3} S^{1/2}$   
 $Q = 1.486 \times 1.57 \times 0.408^{2/3} \times 0.001^{1/2}$   
 $Q = 0.0017 \text{ cfs}$

e) Flow in pipe  
 $Q = 1.486 A R^{2/3} S^{1/2}$   
 $Q = 1.486 \times 1.57 \times 0.408^{2/3} \times 0.001^{1/2}$   
 $Q = 0.0017 \text{ cfs}$

f) Flow in pipe  
 $Q = 1.486 A R^{2/3} S^{1/2}$   
 $Q = 1.486 \times 1.57 \times 0.408^{2/3} \times 0.001^{1/2}$   
 $Q = 0.0017 \text{ cfs}$

g) Flow in pipe  
 $Q = 1.486 A R^{2/3} S^{1/2}$   
 $Q = 1.486 \times 1.57 \times 0.408^{2/3} \times 0.001^{1/2}$   
 $Q = 0.0017 \text{ cfs}$

Flow in pipe			Flow in pipe		Flow in pipe	
Flow	Area	Perimeter	Flow	Area	Perimeter	Flow
1	1.57	1.57	2	1.57	1.57	2.57
2	1.57	1.57	3	1.57	1.57	3.57
3	1.57	1.57	4	1.57	1.57	4.57
4	1.57	1.57	5	1.57	1.57	5.57
5	1.57	1.57	6	1.57	1.57	6.57
6	1.57	1.57	7	1.57	1.57	7.57
7	1.57	1.57	8	1.57	1.57	8.57
8	1.57	1.57	9	1.57	1.57	9.57
9	1.57	1.57	10	1.57	1.57	10.57

Subject Input to the Plant from the City of Boston  
Computation of the Plant from the City of Boston Job No. 100-1000  
Computed by C. W. Checked by C. W. Date 11-10-10

Q. 1. Plant from the City of Boston

Plant from the City of Boston

$$T(0.1) = 1.10' (1.10 - 0.10) (1.10 - 0.10)$$

$$V. 1.10' = 1.10' (1.10 - 0.10) = 1.10' (1.10 - 0.10)$$

$$Q. 1. = \frac{1.10' (1.10 - 0.10)}{1.10' (1.10 - 0.10)} = 1.10'$$

$$1.10' (1.10 - 0.10) = 1.10' (1.10 - 0.10)$$

Q. 1. =

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$$V. 1.10' = 1.10' (1.10 - 0.10) = 1.10' (1.10 - 0.10)$$

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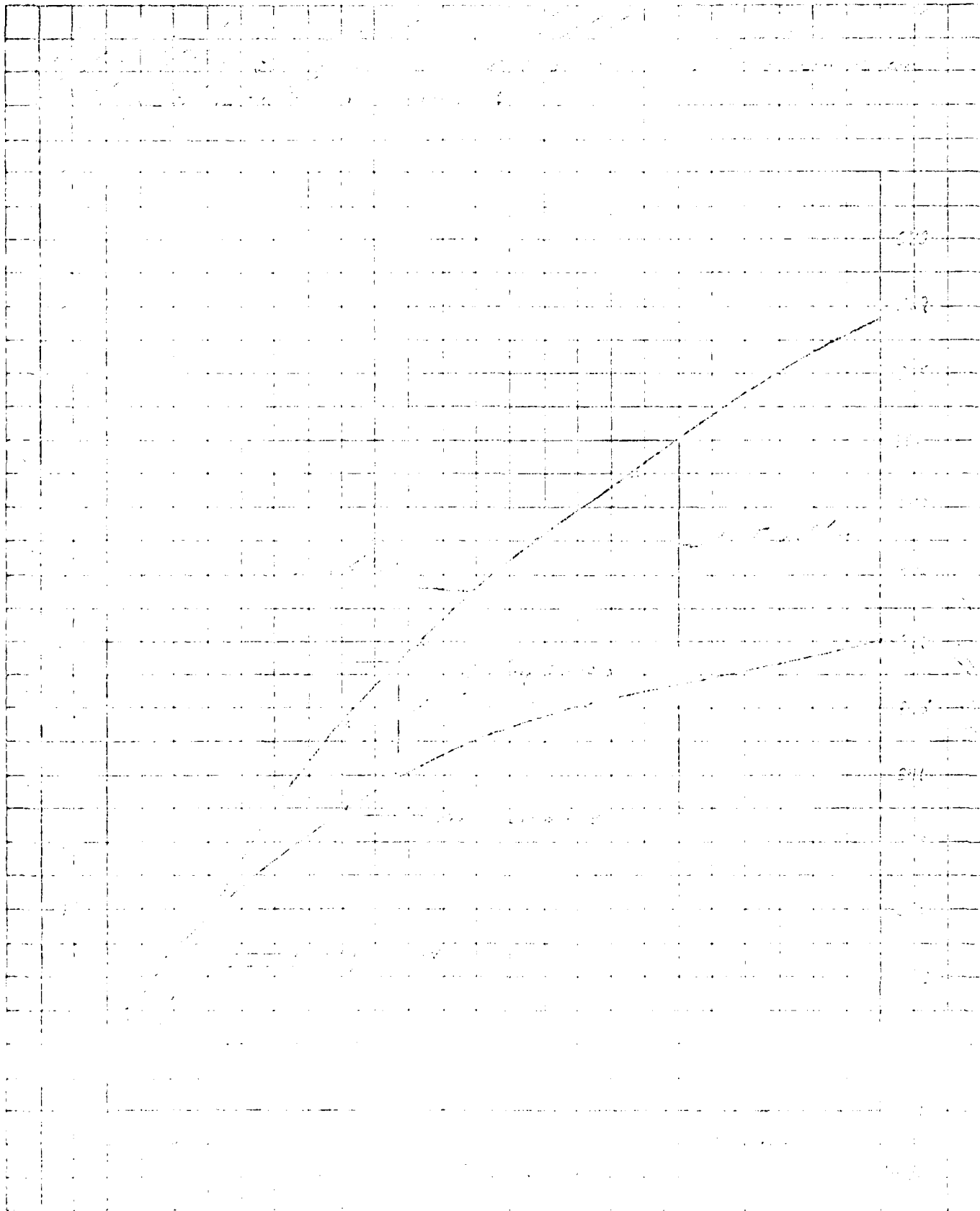
JAMES W. SEWELL COMPANY, OLD TOWN, MAINE  
Civil and Sanitary Engineers

Sheet 12 of 12

Subject Water Supply for the City of Portland, Maine

Computation for the City of Portland, Maine Job No. 500

Computed by J. W. Sewell Checked by J. W. Sewell Date 10/1/10

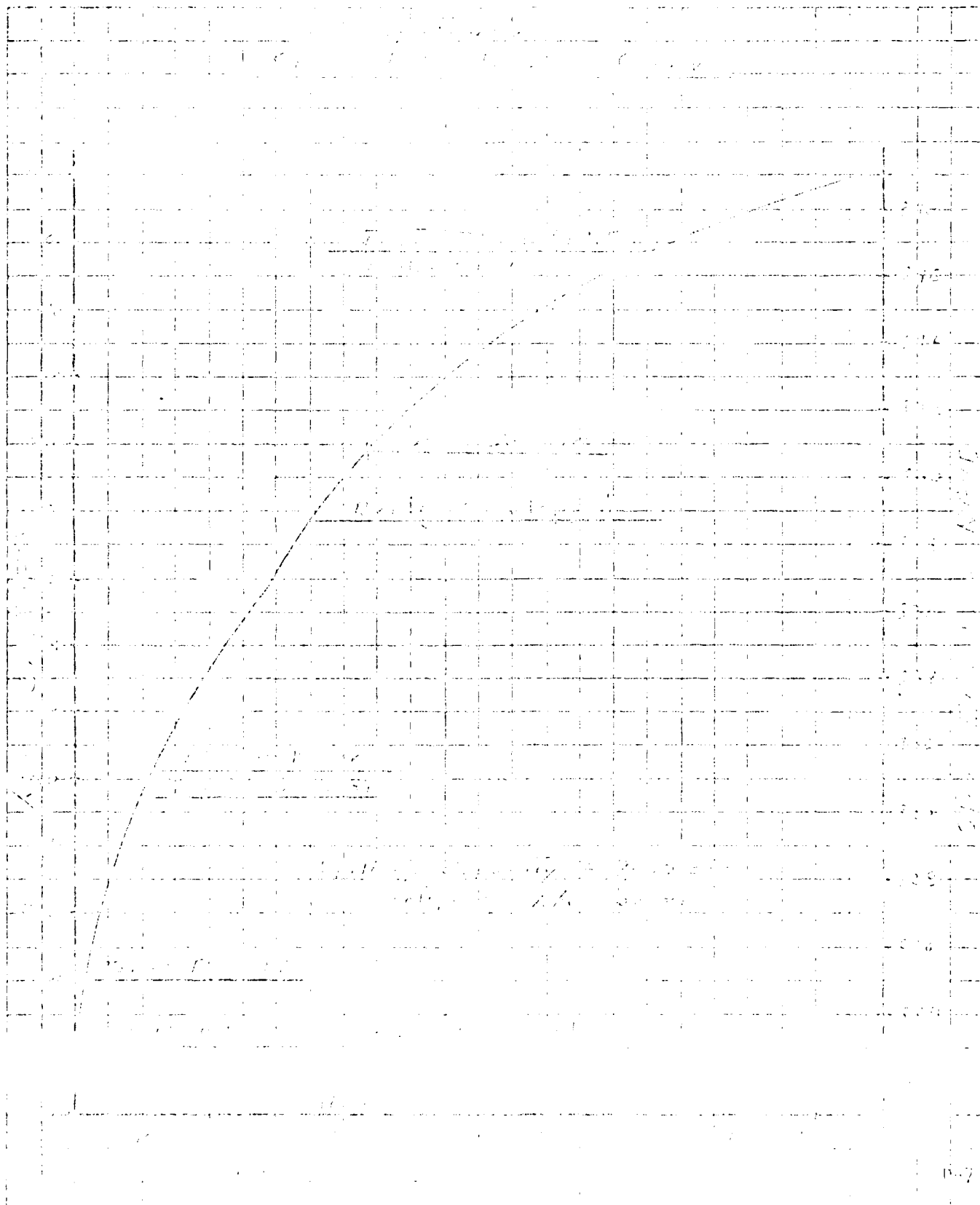




Subject Imp. Sewerage System for Town of Bangor

Computation S. L. De Job No. 222-101-F

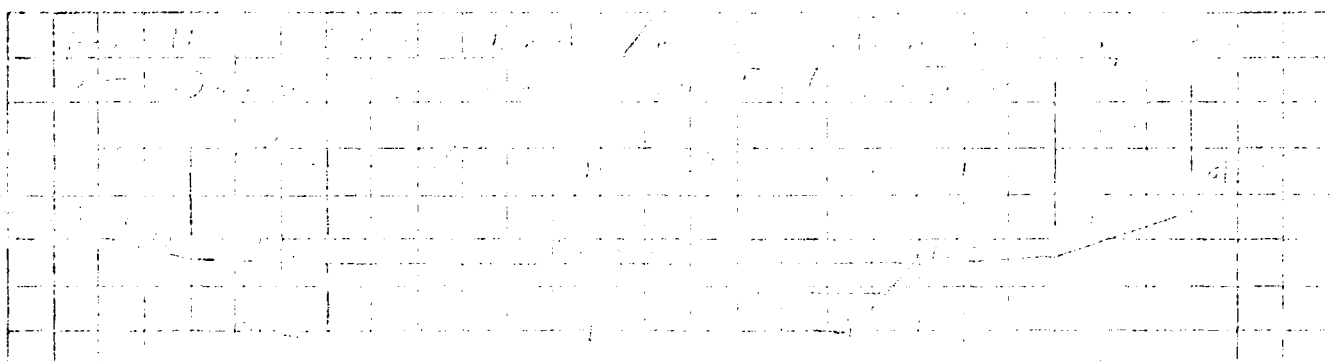
Computed by S. L. De Checked by J. W. Sewell Date 11-24-1911



Subject Design of Sewerage System for the Town of...

Computation Sanitary Engineering Date 11-2-1913

Computed by J. W. Sewell Checked by J. W. Sewell Date 11-2-1913



For  $y \geq 15$ , then  $T$  will be given by  
 $T = 11.5 - 0.00015 (L - 1000)$   
 $T = 11.5 - 0.00015 (1000 - 1000)$   
 $T = 11.5$

$$Q = 1.48 A V \quad (1.48 - 1.48)$$

$$L = 11.5 - 0.00015 (1000 - 1000) = 11.5 - 0 = 11.5$$

$$V = 11.5 - 0.00015 (1000 - 1000) = 11.5 - 0 = 11.5$$

$$V = 11.5 - 0.00015 (1000 - 1000) = 11.5 - 0 = 11.5$$

then  $T$  will be

$$Q = 1.48 A V \quad 11.5 - 0.00015 (1000 - 1000) = 11.5 - 0 = 11.5$$

then

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Computation 1 Doc No. 44-38861-100

Computed by                      Checked by                      Date                     

( )

Wendell Phillips

10 1978 June 1st 1.60

along Tennessee

Dr. T. F. Lewis (p. 163)

REVISED 1-1-1977

Q. I have no other questions.

[illegible]

4) Die Wechselwirkungen

1.  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$  (1/4 of 1/2)

Ex. 05050-1001 April 10, 1910

Dr. E. L. C. C. C. C. C.

Q. Now, I want to ask you, did you see the defendant on the night of the 17th of May, 1968?

Figure 1. The effect of the concentration of the *Agrobacterium* strain on the transformation efficiency of *Agrobacterium* strain 101. The concentration of the *Agrobacterium* strain 101 was varied from 10<sup>6</sup> to 10<sup>9</sup> cells/ml. The transformation efficiency was determined by the number of transformants per 10<sup>6</sup> cells of the *Agrobacterium* strain 101. The data are the mean  $\pm$  SD of three independent experiments.

1. 1994-1995 1995-1996 1996-1997 1997-1998 1998-1999 1999-2000 2000-2001 2001-2002 2002-2003 2003-2004 2004-2005 2005-2006 2006-2007 2007-2008 2008-2009 2009-2010 2010-2011 2011-2012 2012-2013 2013-2014 2014-2015 2015-2016 2016-2017 2017-2018 2018-2019 2019-2020 2020-2021 2021-2022 2022-2023 2023-2024 2024-2025 2025-2026 2026-2027 2027-2028 2028-2029 2029-2030 2030-2031 2031-2032 2032-2033 2033-2034 2034-2035 2035-2036 2036-2037 2037-2038 2038-2039 2039-2040 2040-2041 2041-2042 2042-2043 2043-2044 2044-2045 2045-2046 2046-2047 2047-2048 2048-2049 2049-2050 2050-2051 2051-2052 2052-2053 2053-2054 2054-2055 2055-2056 2056-2057 2057-2058 2058-2059 2059-2060 2060-2061 2061-2062 2062-2063 2063-2064 2064-2065 2065-2066 2066-2067 2067-2068 2068-2069 2069-2070 2070-2071 2071-2072 2072-2073 2073-2074 2074-2075 2075-2076 2076-2077 2077-2078 2078-2079 2079-2080 2080-2081 2081-2082 2082-2083 2083-2084 2084-2085 2085-2086 2086-2087 2087-2088 2088-2089 2089-2090 2090-2091 2091-2092 2092-2093 2093-2094 2094-2095 2095-2096 2096-2097 2097-2098 2098-2099 2099-2100 2100-2101 2101-2102 2102-2103 2103-2104 2104-2105 2105-2106 2106-2107 2107-2108 2108-2109 2109-2110 2110-2111 2111-2112 2112-2113 2113-2114 2114-2115 2115-2116 2116-2117 2117-2118 2118-2119 2119-2120 2120-2121 2121-2122 2122-2123 2123-2124 2124-2125 2125-2126 2126-2127 2127-2128 2128-2129 2129-2130 2130-2131 2131-2132 2132-2133 2133-2134 2134-2135 2135-2136 2136-2137 2137-2138 2138-2139 2139-2140 2140-2141 2141-2142 2142-2143 2143-2144 2144-2145 2145-2146 2146-2147 2147-2148 2148-2149 2149-2150 2150-2151 2151-2152 2152-2153 2153-2154 2154-2155 2155-2156 2156-2157 2157-2158 2158-2159 2159-2160 2160-2161 2161-2162 2162-2163 2163-2164 2164-2165 2165-2166 2166-2167 2167-2168 2168-2169 2169-2170 2170-2171 2171-2172 2172-2173 2173-2174 2174-2175 2175-2176 2176-2177 2177-2178 2178-2179 2179-2180 2180-2181 2181-2182 2182-2183 2183-2184 2184-2185 2185-2186 2186-2187 2187-2188 2188-2189 2189-2190 2190-2191 2191-2192 2192-2193 2193-2194 2194-2195 2195-2196 2196-2197 2197-2198 2198-2199 2199-2200 2200-2201 2201-2202 2202-2203 2203-2204 2204-2205 2205-2206 2206-2207 2207-2208 2208-2209 2209-2210 2210-2211 2211-2212 2212-2213 2213-2214 2214-2215 2215-2216 2216-2217 2217-2218 2218-2219 2219-2220 2220-2221 2221-2222 2222-2223 2223-2224 2224-2225 2225-2226 2226-2227 2227-2228 2228-2229 2229-2230 2230-2231 2231-2232 2232-2233 2233-2234 2234-2235 2235-2236 2236-2237 2237-2238 2238-2239 2239-2240 2240-2241 2241-2242 2242-2243 2243-2244 2244-2245 2245-2246 2246-2247 2247-2248 2248-2249 2249-2250 2250-2251 2251-2252 2252-2253 2253-2254 2254-2255 2255-2256 2256-2257 2257-2258 2258-2259 2259-2260 2260-2261 2261-2262 2262-2263 2263-2264 2264-2265 2265-2266 2266-2267

*[Faint handwritten notes at the bottom of the page]*



[illegible]

**Computation**      **Time**

11

SECRET

[illegible]

JAMES M. SEIBER, CHAIRMAN, AND  
CIVIL AND SECURITY DIVISION

1. *Chlorophyll a* (Chl *a*)

[illegible]

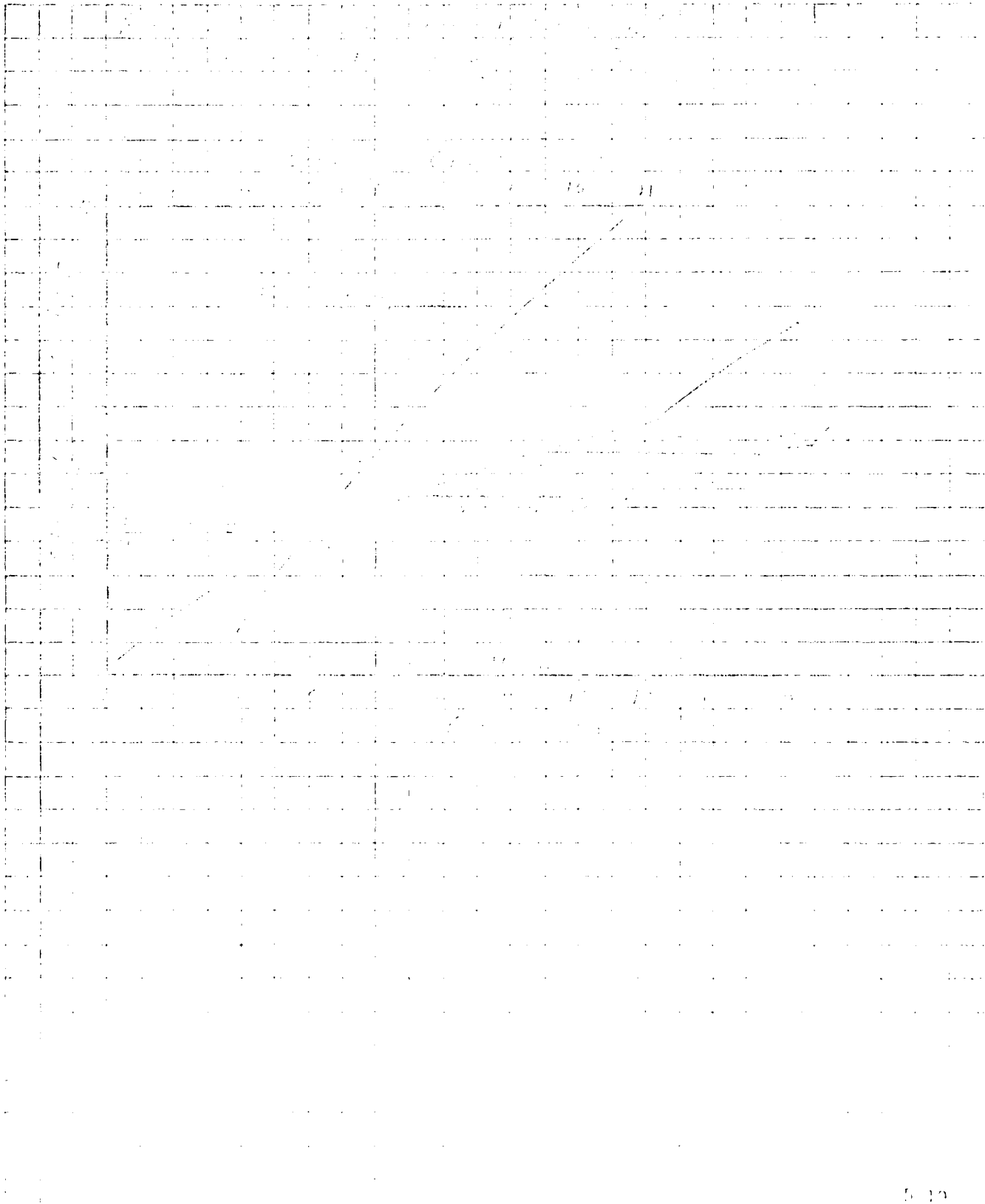
*(continued)*

$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx$

Sheet 1 of 1

**Computation**

Computed by \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

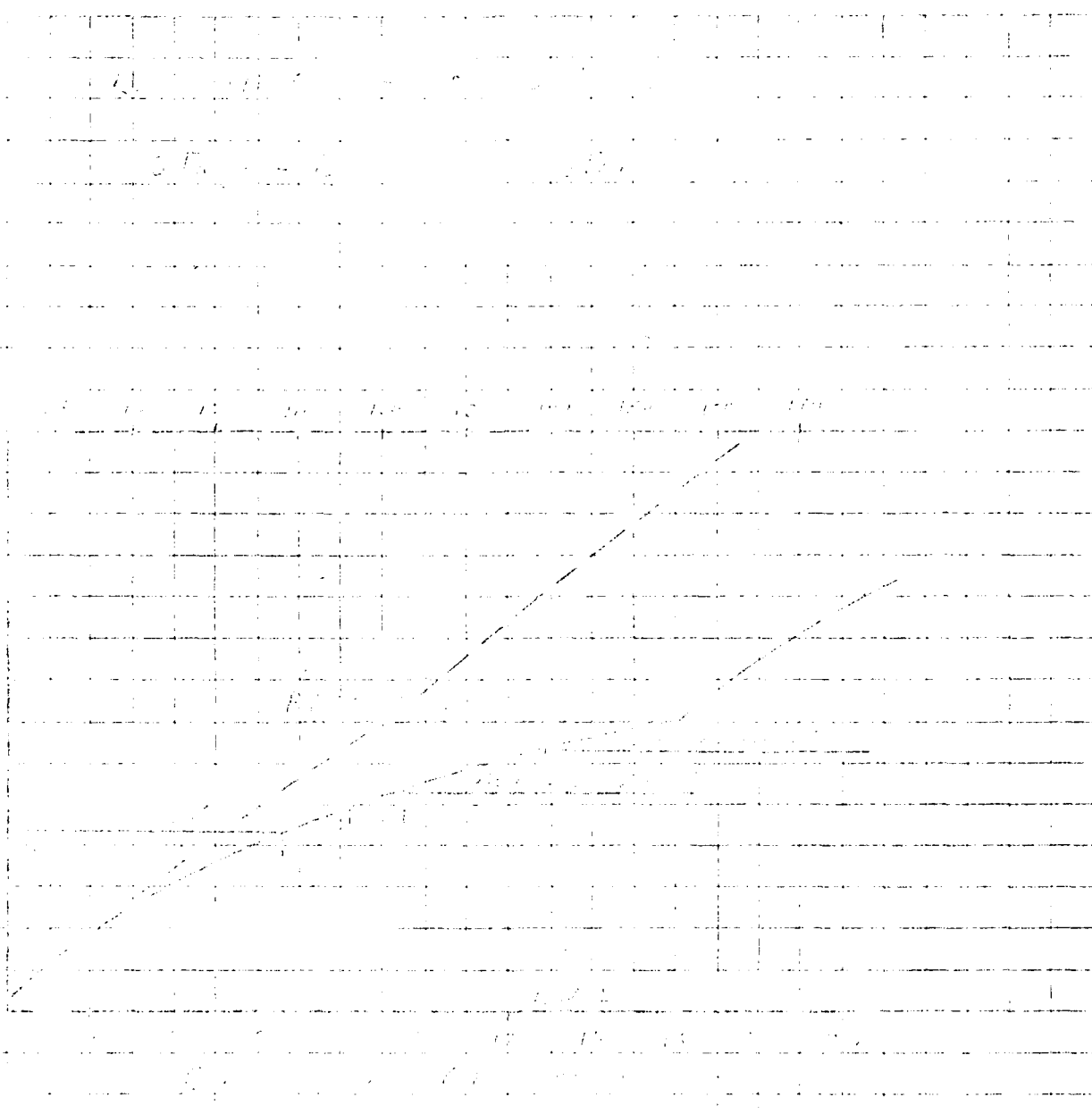


## Sheet \_\_\_\_\_ of \_\_\_\_\_

Source: <http://www.fishbase.org>

[illegible]

Checked by \_\_\_\_\_ Date \_\_\_\_\_





Subject Design of Sewerage System for the Town of...

Computation by J. W. Sewell Job No. 101

Computed by J. W. Sewell Checked by J. W. Sewell Date 11-1-11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
<p>Design of Sewerage System for the Town of...</p> <p>1. <u>Flow</u> <math>Q = 1.5</math> <math>\text{cfs}</math></p> <p>2. <u>Velocity</u> <math>V = 2.0</math> <math>\text{ft/sec}</math></p> <p>3. <u>Depth</u> <math>D = 1.5</math> <math>\text{ft}</math></p> <p>4. <u>Width</u> <math>B = 1.5</math> <math>\text{ft}</math></p> <p>5. <u>Area</u> <math>A = 2.25</math> <math>\text{sq ft}</math></p> <p>6. <u>Volume</u> <math>V = 3.375</math> <math>\text{cu ft}</math></p> <p>7. <u>Weight</u> <math>W = 26.25</math> <math>\text{lb}</math></p> <p>8. <u>Force</u> <math>F = 26.25</math> <math>\text{lb}</math></p> <p>9. <u>Moment</u> <math>M = 39.375</math> <math>\text{ft-lb}</math></p> <p>10. <u>Energy</u> <math>E = 58.96875</math> <math>\text{ft-lb}</math></p> <p>11. <u>Power</u> <math>P = 88.453125</math> <math>\text{ft-lb/sec}</math></p> <p>12. <u>Work</u> <math>W = 132.67875</math> <math>\text{ft-lb}</math></p> <p>13. <u>Heat</u> <math>H = 200.018125</math> <math>\text{Btu}</math></p> <p>14. <u>Temperature</u> <math>T = 300.0271875</math> <math>^{\circ}\text{F}</math></p> <p>15. <u>Pressure</u> <math>P = 450.04078125</math> <math>\text{lb/ft}^2</math></p> <p>16. <u>Stress</u> <math>S = 675.061171875</math> <math>\text{lb/ft}^2</math></p> <p>17. <u>Strain</u> <math>\epsilon = 1012.5917578125</math> <math>\text{in/in}</math></p> <p>18. <u>Displacement</u> <math>\delta = 1518.88763671875</math> <math>\text{in}</math></p> <p>19. <u>Deflection</u> <math>\Delta = 2278.281455078125</math> <math>\text{in}</math></p> <p>20. <u>Rotation</u> <math>\theta = 3417.4221826171875</math> <math>\text{in}</math></p> <p>21. <u>Twist</u> <math>\phi = 5126.13327392578125</math> <math>\text{in}</math></p> <p>22. <u>Curvature</u> <math>\kappa = 7689.199910888671875</math> <math>\text{in}</math></p> <p>23. <u>Frequency</u> <math>f = 11534.31981742145625</math> <math>\text{in}</math></p> <p>24. <u>Wavelength</u> <math>\lambda = 17301.479726132184375</math> <math>\text{in}</math></p> <p>25. <u>Period</u> <math>T = 26002.2595391982765625</math> <math>\text{in}</math></p> <p>26. <u>Amplitude</u> <math>A = 39003.38930879741484375</math> <math>\text{in}</math></p> <p>27. <u>Phase</u> <math>\phi = 58504.5786175948296875</math> <math>\text{in}</math></p> <p>28. <u>Frequency</u> <math>f = 87005.7679263917140625</math> <math>\text{in}</math></p> <p>29. <u>Wavelength</u> <math>\lambda = 130508.65188958757109375</math> <math>\text{in}</math></p> <p>30. <u>Period</u> <math>T = 195762.9778343813565625</math> <math>\text{in}</math></p> <p>31. <u>Amplitude</u> <math>A = 293644.36775157203484375</math> <math>\text{in}</math></p> <p>32. <u>Phase</u> <math>\phi = 440466.551627358052265625</math> <math>\text{in}</math></p> <p>33. <u>Frequency</u> <math>f = 65253.87794479126046875</math> <math>\text{in}</math></p> <p>34. <u>Wavelength</u> <math>\lambda = 97880.816917186890703125</math> <math>\text{in}</math></p> <p>35. <u>Period</u> <math>T = 146816.2253757798360625</math> <math>\text{in}</math></p> <p>36. <u>Amplitude</u> <math>A = 220224.33806366975409375</math> <math>\text{in}</math></p> <p>37. <u>Phase</u> <math>\phi = 330336.507095504631145625</math> <math>\text{in}</math></p> <p>38. <u>Frequency</u> <math>f = 48502.9084585934203125</math> <math>\text{in}</math></p> <p>39. <u>Wavelength</u> <math>\lambda = 72754.36268789013046875</math> <math>\text{in}</math></p> <p>40. <u>Period</u> <math>T = 109131.544031835195703125</math> <math>\text{in}</math></p> <p>41. <u>Amplitude</u> <math>A = 165168.25805527662854375</math> <math>\text{in}</math></p> <p>42. <u>Phase</u> <math>\phi = 247752.3870829149428125</math> <math>\text{in}</math></p> <p>43. <u>Frequency</u> <math>f = 36377.18132394506546875</math> <math>\text{in}</math></p> <p>44. <u>Wavelength</u> <math>\lambda = 54565.771985917598203125</math> <math>\text{in}</math></p> <p>45. <u>Period</u> <math>T = 82609.653325876397109375</math> <math>\text{in}</math></p> <p>46. <u>Amplitude</u> <math>A = 123876.19354145747140625</math> <math>\text{in}</math></p> <p>47. <u>Phase</u> <math>\phi = 185814.28031218620703125</math> <math>\text{in}</math></p> <p>48. <u>Frequency</u> <math>f = 27282.886002958799109375</math> <math>\text{in}</math></p> <p>49. <u>Wavelength</u> <math>\lambda = 40924.329004438198203125</math> <math>\text{in}</math></p> <p>50. <u>Period</u> <math>T = 61390.903506656797109375</math> <math>\text{in}</math></p> <p>51. <u>Amplitude</u> <math>A = 92907.145156108148145625</math> <math>\text{in}</math></p> <p>52. <u>Phase</u> <math>\phi = 139360.7177386622265625</math> <math>\text{in}</math></p> <p>53. <u>Frequency</u> <math>f = 20462.1892522190993125</math> <math>\text{in}</math></p> <p>54. <u>Wavelength</u> <math>\lambda = 30693.2838783286484375</math> <math>\text{in}</math></p> <p>55. <u>Period</u> <math>T = 46039.92581749297265625</math> <math>\text{in}</math></p> <p>56. <u>Amplitude</u> <math>A = 70205.35786708111109375</math> <math>\text{in}</math></p> <p>57. <u>Phase</u> <math>\phi = 105308.03680062166796875</math> <math>\text{in}</math></p> <p>58. <u>Frequency</u> <math>f = 15346.64193916432446875</math> <math>\text{in}</math></p> <p>59. <u>Wavelength</u> <math>\lambda = 23019.962908746886453125</math> <math>\text{in}</math></p> <p>60. <u>Period</u> <math>T = 34529.9443631203296875</math> <math>\text{in}</math></p> <p>61. <u>Amplitude</u> <math>A = 52654.0184003108358125</math> <math>\text{in}</math></p> <p>62. <u>Phase</u> <math>\phi = 78981.027600450704296875</math> <math>\text{in}</math></p> <p>63. <u>Frequency</u> <math>f = 11512.981454373243359375</math> <math>\text{in}</math></p> <p>64. <u>Wavelength</u> <math>\lambda = 17269.47218155986453125</math> <math>\text{in}</math></p> <p>65. <u>Period</u> <math>T = 25958.948325229751953125</math> <math>\text{in}</math></p> <p>66. <u>Amplitude</u> <math>A = 40240.513800233126875</math> <math>\text{in}</math></p> <p>67. <u>Phase</u> <math>\phi = 60320.77080032087354375</math> <math>\text{in}</math></p> <p>68. <u>Frequency</u> <math>f = 8634.23609077993251953125</math> <math>\text{in}</math></p> <p>69. <u>Wavelength</u> <math>\lambda = 12901.35313616989875</math> <math>\text{in}</math></p> <p>70. <u>Period</u> <math>T = 19442.4902512548125</math> <math>\text{in}</math></p> <p>71. <u>Amplitude</u> <math>A = 30180.38535017484015625</math> <math>\text{in}</math></p> <p>72. <u>Phase</u> <math>\phi = 45135.57600024065515625</math> <math>\text{in}</math></p> <p>73. <u>Frequency</u> <math>f = 6475.677068084949390625</math> <math>\text{in}</math></p> <p>74. <u>Wavelength</u> <math>\lambda = 9713.0167032448740625</math> <math>\text{in}</math></p> <p>75. <u>Period</u> <math>T = 14538.5950548672609375</math> <math>\text{in}</math></p> <p>76. <u>Amplitude</u> <math>A = 22635.289012631130125</math> <math>\text{in}</math></p> <p>77. <u>Phase</u> <math>\phi = 33851.682000180487875</math> <math>\text{in}</math></p> <p>78. <u>Frequency</u> <math>f = 4856.757701063711990625</math> <math>\text{in}</math></p> <p>79. <u>Wavelength</u> <math>\lambda = 7285.1250548696978125</math> <math>\text{in}</math></p> <p>80. <u>Period</u> <math>T = 10908.7000912544375</math> <math>\text{in}</math></p> <p>81. <u>Amplitude</u> <math>A = 16976.4667594733478125</math> <math>\text{in}</math></p> <p>82. <u>Phase</u> <math>\phi = 25463.7740001353658125</math> <math>\text{in}</math></p> <p>83. <u>Frequency</u> <math>f = 3639.068275797781490625</math> <math>\text{in}</math></p> <p>84. <u>Wavelength</u> <math>\lambda = 5458.69038115458359375</math> <math>\text{in}</math></p> <p>85. <u>Period</u> <math>T = 8200.9201150061125</math> <math>\text{in}</math></p> <p>86. <u>Amplitude</u> <math>A = 12732.350069605010875</math> <math>\text{in}</math></p> <p>87. <u>Phase</u> <math>\phi = 19090.0250001015244375</math> <math>\text{in}</math></p> <p>88. <u>Frequency</u> <math>f = 2726.5512068483361171875</math> <math>\text{in}</math></p> <p>89. <u>Wavelength</u> <math>\lambda = 4092.815485715875</math> <math>\text{in}</math></p> <p>90. <u>Period</u> <math>T = 6136.022728125</math> <math>\text{in}</math></p> <p>91. <u>Amplitude</u> <math>A = 9549.262552303758125</math> <math>\text{in}</math></p> <p>92. <u>Phase</u> <math>\phi = 14295.01875007614328125</math> <math>\text{in}</math></p> <p>93. <u>Frequency</u> <math>f = 2044.91340516125</math> <math>\text{in}</math></p> <p>94. <u>Wavelength</u> <math>\lambda = 3068.7116282875</math> <math>\text{in}</math></p> <p>95. <u>Period</u> <math>T = 4601.26744375</math> <math>\text{in}</math></p> <p>96. <u>Amplitude</u> <math>A = 7161.9469142278125</math> <math>\text{in}</math></p> <p>97. <u>Phase</u> <math>\phi = 10717.514062505607421875</math> <math>\text{in}</math></p> <p>98. <u>Frequency</u> <math>f = 1533.6850538709375</math> <math>\text{in}</math></p> <p>99. <u>Wavelength</u> <math>\lambda = 2301.53372125</math> <math>\text{in}</math></p> <p>100. <u>Period</u> <math>T = 3452.29053125</math> <math>\text{in}</math></p>																																																																																																			

## Structure of the Paper

Computation Date Recd. \_\_\_\_\_

Computed by \_\_\_\_\_ Checked by \_\_\_\_\_ Date 11/1/2011

[illegible]

Computed by                      Checked by                      Date 11/1/00

1.  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$   
 2.  $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$   
 3.  $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$   
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 8.  $\frac{1}{2} \times \frac{1}{32} = \frac{1}{64}$   
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 40.  $\frac{1}{2} \times \frac{1}{4194304} = \frac{1}{4194304}$   
 41.  $\frac{1}{4} \times \frac{1}{4194304} = \frac{1}{8388608}$   
 42.  $\frac{1}{2} \times \frac{1}{8388608} = \frac{1}{8388608}$   
 43.  $\frac{1}{4} \times \frac{1}{8388608} = \frac{1}{16777216}$   
 44.  $\frac{1}{2} \times \frac{1}{16777216} = \frac{1}{16777216}$   
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 56.  $\frac{1}{2} \times \frac{1}{1073741824} = \frac{1}{1073741824}$   
 57.  $\frac{1}{4} \times \frac{1}{1073741824} = \frac{1}{2147483648}$   
 58.  $\frac{1}{2} \times \frac{1}{2147483648} = \frac{1}{2147483648}$   
 59.  $\frac{1}{4} \times \frac{1}{2147483648} = \frac{1}{4294967296}$   
 60.  $\frac{1}{2} \times \frac{1}{4294967296} = \frac{1}{4294967296}$   
 61.  $\frac{1}{4} \times \frac{1}{4294967296} = \frac{1}{8589934592}$   
 62.  $\frac{1}{2} \times \frac{1}{8589934592} = \frac{1}{8589934592}$   
 63.  $\frac{1}{4} \times \frac{1}{8589934592} = \frac{1}{17179869184}$   
 64.  $\frac{1}{2} \times \frac{1}{17179869184} = \frac{1}{17179869184}$   
 65.  $\frac{1}{4} \times \frac{1}{17179869184} = \frac{1}{34359738368}$   
 66.  $\frac{1}{2} \times \frac{1}{34359738368} = \frac{1}{34359738368}$   
 67.  $\frac{1}{4} \times \frac{1}{34359738368} = \frac{1}{68719476736}$   
 68.  $\frac{1}{2} \times \frac{1}{68719476736} = \frac{1}{68719476736}$   
 69.  $\frac{1}{4} \times \frac{1}{68719476736} = \frac{1}{137438953472}$   
 70.  $\frac{1}{2} \times \frac{1}{137438953472} = \frac{1}{137438953472}$   
 71.  $\frac{1}{4} \times \frac{1}{137438953472} = \frac{1}{274877906944}$   
 72.  $\frac{1}{2} \times \frac{1}{274877906944} = \frac{1}{274877906944}$   
 73.  $\frac{1}{4} \times \frac{1}{274877906944} = \frac{1}{549755813888}$   
 74.  $\frac{1}{2} \times \frac{1}{549755813888} = \frac{1}{549755813888}$   
 75.  $\frac{1}{4} \times \frac{1}{549755813888} = \frac{1}{1099511627776}$   
 76.  $\frac{1}{2} \times \frac{1}{1099511627776} = \frac{1}{1099511627776}$   
 77.  $\frac{1}{4} \times \frac{1}{1099511627776} = \frac{1}{2199023255552}$   
 78.  $\frac{1}{2} \times \frac{1}{2199023255552} = \frac{1}{2199023255552}$   
 79.  $\frac{1}{4} \times \frac{1}{2199023255552} = \frac{1}{4398046511104}$   
 80.  $\frac{1}{2} \times \frac{1}{4398046511104} = \frac{1}{4398046511104}$   
 81.  $\frac{1}{4} \times \frac{1}{4398046511104} = \frac{1}{8796093022208}$   
 82.  $\frac{1}{2} \times \frac{1}{8796093022208} = \frac{1}{8796093022208}$   
 83.  $\frac{1}{4} \times \frac{1}{8796093022208} = \frac{1}{17592186044416}$   
 84.  $\frac{1}{2} \times \frac{1}{17592186044416} = \frac{1}{175921$

JAMES W. SENEALL COMPANY, OLD TOLL, N. H.  
Civil and Sanitary Engineer

Suppose that

Subject

Computation 6.25 10

Computed by IC 107 Checked by IC 107 Date 10/1/10

1.  $\frac{1}{2}$  of the total  
 2.  $\frac{1}{4}$  of the total  
 3.  $\frac{1}{8}$  of the total  
 4.  $\frac{1}{16}$  of the total  
 5.  $\frac{1}{32}$  of the total  
 6.  $\frac{1}{64}$  of the total  
 7.  $\frac{1}{128}$  of the total  
 8.  $\frac{1}{256}$  of the total  
 9.  $\frac{1}{512}$  of the total  
 10.  $\frac{1}{1024}$  of the total  
 11.  $\frac{1}{2048}$  of the total  
 12.  $\frac{1}{4096}$  of the total  
 13.  $\frac{1}{8192}$  of the total  
 14.  $\frac{1}{16384}$  of the total  
 15.  $\frac{1}{32768}$  of the total  
 16.  $\frac{1}{65536}$  of the total  
 17.  $\frac{1}{131072}$  of the total  
 18.  $\frac{1}{262144}$  of the total  
 19.  $\frac{1}{524288}$  of the total  
 20.  $\frac{1}{1048576}$  of the total  
 21.  $\frac{1}{2097152}$  of the total  
 22.  $\frac{1}{4194304}$  of the total  
 23.  $\frac{1}{8388608}$  of the total  
 24.  $\frac{1}{16777216}$  of the total  
 25.  $\frac{1}{33554432}$  of the total  
 26.  $\frac{1}{67108864}$  of the total  
 27.  $\frac{1}{134217728}$  of the total  
 28.  $\frac{1}{268435456}$  of the total  
 29.  $\frac{1}{536870912}$  of the total  
 30.  $\frac{1}{1073741824}$  of the total  
 31.  $\frac{1}{2147483648}$  of the total  
 32.  $\frac{1}{4294967296}$  of the total  
 33.  $\frac{1}{8589934592}$  of the total  
 34.  $\frac{1}{17179869184}$  of the total  
 35.  $\frac{1}{34359738368}$  of the total  
 36.  $\frac{1}{68719476736}$  of the total  
 37.  $\frac{1}{137438953472}$  of the total  
 38.  $\frac{1}{274877906944}$  of the total  
 39.  $\frac{1}{549755813888}$  of the total  
 40.  $\frac{1}{1099511627776}$  of the total  
 41.  $\frac{1}{2199023255552}$  of the total  
 42.  $\frac{1}{4398046511104}$  of the total  
 43.  $\frac{1}{8796093022208}$  of the total  
 44.  $\frac{1}{17592186044416}$  of the total  
 45.  $\frac{1}{35184372088832}$  of the total  
 46.  $\frac{1}{70368744177664}$  of the total  
 47.  $\frac{1}{140737488355328}$  of the total  
 48.  $\frac{1}{281474976710656}$  of the total  
 49.  $\frac{1}{562949953421312}$  of the total  
 50.  $\frac{1}{1125899906842624}$  of the total  
 51.  $\frac{1}{2251799813685248}$  of the total  
 52.  $\frac{1}{4503599627370496}$  of the total  
 53.  $\frac{1}{9007199254740992}$  of the total  
 54.  $\frac{1}{18014398509481984}$  of the total  
 55.  $\frac{1}{36028797018963968}$  of the total  
 56.  $\frac{1}{72057594037927936}$  of the total  
 57.  $\frac{1}{144115188075855872}$  of the total  
 58.  $\frac{1}{288230376151711744}$  of the total  
 59.  $\frac{1}{576460752303423488}$  of the total  
 60.  $\frac{1}{1152921504606846976}$  of the total  
 61.  $\frac{1}{2305843009213693952}$  of the total  
 62.  $\frac{1}{4611686018427387904}$  of the total  
 63.  $\frac{1}{9223372036854775808}$  of the total  
 64.  $\frac{1}{18446744073709551616}$  of the total  
 65.  $\frac{1}{36893488147419103232}$  of the total  
 66.  $\frac{1}{73786976294838206464}$  of the total  
 67.  $\frac{1}{147573952589676412928}$  of the total  
 68.  $\frac{1}{295147905179352825856}$  of the total  
 69.  $\frac{1}{590295810358705651712}$  of the total  
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 72.  $\frac{1}{4722366482869645213696}$  of the total  
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 75.  $\frac{1}{37778931862957161709568}$  of the total  
 76.  $\frac{1}{75557863725914323419136}$  of the total  
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 78.  $\frac{1}{302231454903657293676544}$  of the total  
 79.  $\frac{1}{604462909807314587353088}$  of the total  
 80.  $\frac{1}{1208925819614629174706176}$  of the total  
 81.  $\frac{1}{2417851639229258349412352}$  of the total  
 82.  $\frac{1}{4835703278458516698824704}$  of the total  
 83.  $\frac{1}{9671406556917033397649408}$  of the total  
 84.  $\frac{1}{19342813113834066795298816}$  of the total  
 85.  $\frac{1}{38685626227668133590597632}$  of the total  
 86.  $\frac{1}{77371252455336267181195264}$  of the total  
 87.  $\frac{1}{154742504910672534362390528}$  of the total  
 88.  $\frac{1}{309485009821345068724781056}$  of the total  
 89.  $\frac{1}{618970019642690137449562112}$  of the total  
 90.  $\frac{1}{1237940039285380274899124224}$  of the total  
 91.  $\frac{1}{2475880078570760549798248448}$  of the total  
 92.  $\frac{1}{4951760157141521099596496896}$  of the total  
 93.  $\frac{1}{9903520314283042199192993792}$  of the total  
 94.  $\frac{1}{19807040628566084398385987584}$  of the total  
 95.  $\frac{1}{39614081257132168796771975168}$  of the total  
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 97.  $\frac{1}{158456325028528675187087900672}$  of the total  
 98.  $\frac{1}{316912650057057350374175801344}$  of the total  
 99.  $\frac{1}{633825300114114700748351602688}$  of the total  
 100.  $\frac{1}{1267650600228229401496703205376}$  of the total  
 101.  $\frac{1}{2535301200456458802993406410752}$  of the total  
 102.  $\frac{1}{5070602400912917605986812821504}$  of the total  
 103.  $\frac{1}{10141204801825835211973625643008}$  of the total  
 104.  $\frac{1}{20282409603651670423947251286016}$  of the total  
 105.  $\frac{1}{40564819207303340847894502572032}$  of the total  
 106.  $\frac{1}{81129638414606681695789005144064}$  of the total  
 107.  $\frac{1}{162259276829213363391578010288128}$  of the total  
 108.  $\frac{1}{324518553658426726783156020576256}$  of the total

11-24

PRELIMINARY GUIDANCE  
FOR ESTIMATING  
MAXIMUM PROBABLE DISCHARGES  
IN  
PHASE I DAM SAFETY  
INVESTIGATIONS

New England Division  
Corps of Engineers

March 1978

WATERSHED PROPOSED FLOOD CONTROL  
AND RES. WORKS

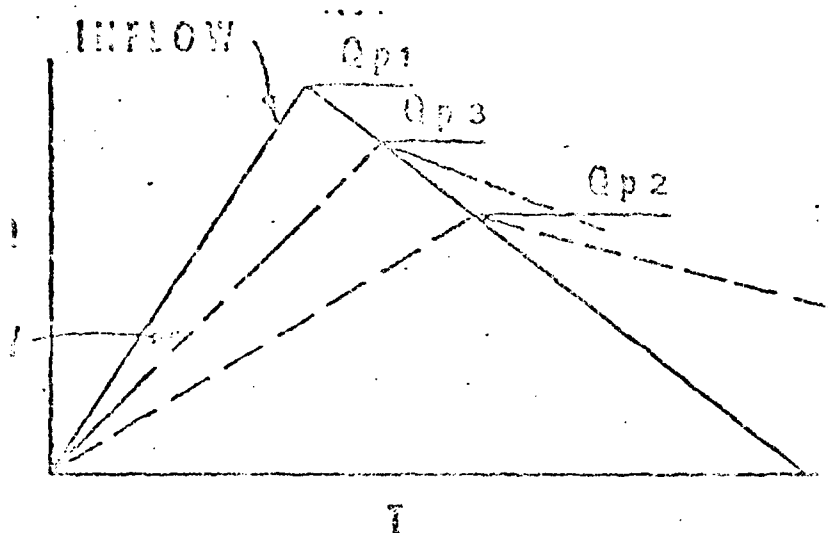
<u>Project</u>	<u>C</u> <u>(cfs)</u>	<u>B.A.</u> <u>(sq. mi.)</u>	<u>MPF</u> <u>cfs/sq. mi.</u>
1. Hall Meadow Brook	26,000	17.2	1,546
2. West Branch	15,500	9.25	1,675
3. Thompson	158,000	87.2	1,825
4. Northfield Brook	9,000	5.7	1,580
5. Black Rock	25,000	20.4	1,715
6. Hancock Brook	20,700	12.6	1,725
7. Hop Brook	25,400	16.4	1,610
8. Tully	47,000	50.0	940
9. Parre Falls	61,000	55.0	1,109
10. Conant Brook	11,900	7.8	1,525
11. Knightville	160,000	162.0	987
12. Littleville	98,000	52.3	1,870
13. Colebrook River	165,000	118.0	1,400
14. Mad River	30,000	18.2	1,650
15. Sucker Brook	6,500	3.43	1,895
16. Union Village	110,000	126.0	873
17. North Hartland	199,000	220.0	904
18. North Springfield	157,000	158.0	994
19. Ball Mountain	190,000	172.0	1,105
20. Townshend	228,000	106.0(278 total)	820
21. Surry Mountain	63,000	100.0	630
22. Otter Brook	45,000	47.0	957
23. Birch Hill	88,500	175.0	505
24. East Brimfield	73,900	67.5	1,095
25. Westville	38,400	99.5(32 net)	1,200
26. West Thompson	85,000	173.5(74 net)	1,150
27. Ledges Village	38,800	31.1	1,145
28. Buffumville	33,500	26.5	1,377
29. Mansfield Hollow	125,000	159.0	786
30. West Hill	26,000	28.0	928
31. Franklin Falls	210,000	1000.0	210
32. Blackwater	65,500	128.0	520
33. Hopkinton	138,000	420.0	316
34. Everett	65,000	64.0	1,062
35. Middlebury	55,000	44.0	1,250

INVENTORY OF THE FLOODS  
 CAUSED BY THE  
 FLOODING OF THE  
 (State and Federal Areas)

River	SEF (cfs)	D.A. (sq. ft.)	SEF (cfs/sq. mi.)
1. Pawtucket River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Heph.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330



# ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE FLOOD RUNOFFS



EP 1: Determine Peak Inflow ( $Q_{p1}$ ) from Guide Curves.

EP 2: a. Determine Surcharge Height To Pass " $Q_{p1}$ ".

b. Determine Volume of Surcharge ( $STOR_1$ ) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore

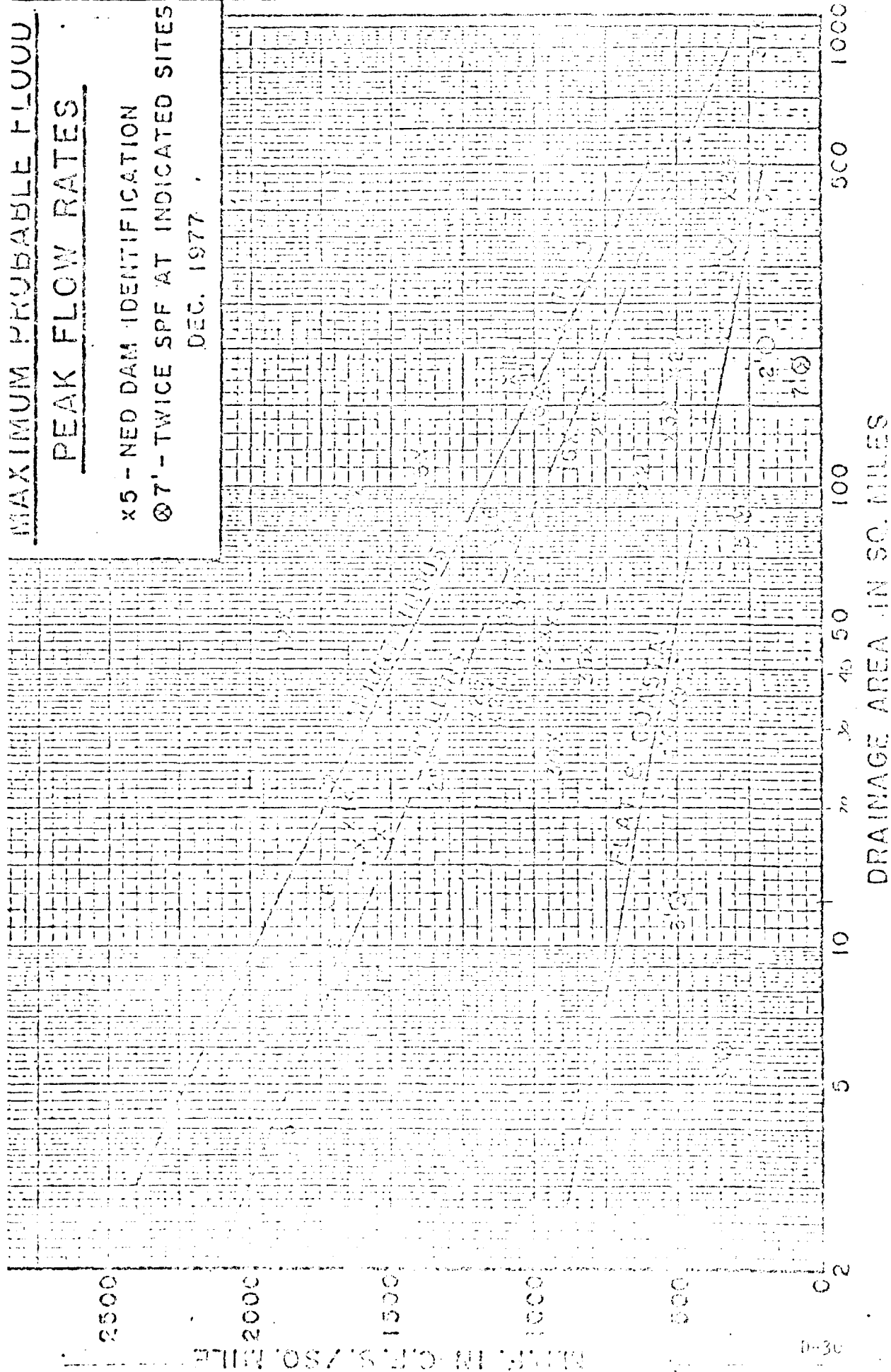
$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$

EP 3: a. Determine Surcharge Height and " $STOR_2$ " To Pass " $Q_{p2}$ ".

b. Average " $STOR_1$ " and " $STOR_2$ " and Determine Average Inflow and Resulting Peak Outflow " $Q_{p3}$ ".

# MAXIMUM PROBABLE FLOOD PEAK FLOW RATES

X5 - NED DAM IDENTIFICATION  
 @7' - TWICE SPF AT INDICATED SITES  
 DEC. 1977



AD-A155 796

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS  
SEBEC DAM NE 00163 PE. (U) CORPS OF ENGINEERS WALTHAM  
HA NEW ENGLAND DIV JUN 81

2/2

UNCLASSIFIED

F/G 13/13

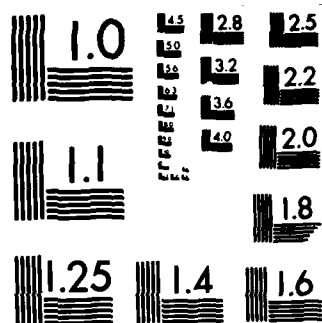
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END

FILED

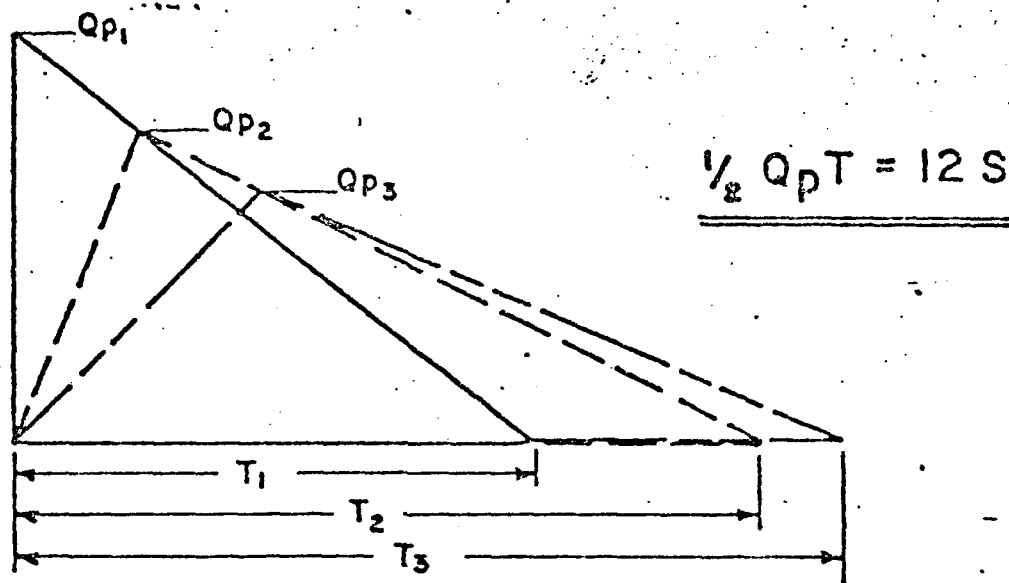
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DTIC



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

# "RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



**STEP 1:** DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

**STEP 2:** DETERMINE PEAK FAILURE OUTFLOW ( $Q_{p1}$ ).

$$Q_{p1} = \frac{8}{27} W_b \sqrt{g} Y_0^{3/2}$$

$W_b$  = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

$Y_0$  = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

**STEP 3:** USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

**STEP 4:** ESTIMATE REACH OUTFLOW ( $Q_{p2}$ ) USING FOLLOWING ITERATION.

A. APPLY  $Q_{p1}$  TO STAGE RATING, DETERMINE STAGE AND ACCOMPANYING VOLUME ( $V_1$ ) IN REACH IN AC-FT. (NOTE: IF  $V_1$  EXCEEDS  $1/2$  OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL  $Q_{p2}$ :

$$Q_{p2}(\text{TRIAL}) = Q_{p1} \left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE  $V_2$  USING  $Q_{p2}(\text{TRIAL})$ .

D. AVERAGE  $V_1$  AND  $V_2$  AND COMPUTE  $Q_{p2}$ .

$$Q_{p2} = Q_{p1} \left(1 - \frac{V_{\text{avg}}}{S}\right)$$

**STEP 5:** FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

**END**

**FILMED**

**8-85**

**DTIC**